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Outlook for the Paper Industry in 1945

Secretary E. W. Tinker of American Paper and Pulp Association Discusses Past Performances and Future Prospects of Paper Industry—How To Maintain High Production Is Major Problem.

E. W. Tinker, executive secretary of the American Paper and Pulp Association speaking at the tenth annual joint meeting of the Michigan Division of the American Pulp and Paper Mill Superintendents Association, and the Kalamazoo Valley Section of the Technical Association of the Pulp and Paper Industry, held January 11, 1945, at Kalamazoo, Mich., expressed the following views on the outlook for the paper industry for the ensuing year:

Before attempting to analyze the outlook for 1945, I would like to review a little history.

Since the initiation of the National Defense Program in 1940, the pulp and paper industry has, of necessity, had to meet problems that might have had disastrous effect not only upon individual companies but on the entire war program itself. These problems have been so numerous and the implications so far-reaching that actions of various kinds have been necessary and particularly actions that would bring results. To illustrate, I would like to cite four major decisions that have drastically affected the industry since the initiation of the National Defense Program and in every one of these decisions I submit that the industry has done its part to chart a course, not only in the interests of the welfare of the industry but of the national wartime economy. Because of general misconceptions, particularly within military circles, as to the essentiality of the pulp and paper industry, our course has not been an easy one. In the main, these misconceptions have been corrected but even yet there is room for much improvement, particularly in the War Manpower Commission's attitude toward the essentiality of paper and paper products under the existing circumstances. Even heroic efforts on the part of the War Production Board itself have not been able to rectify the situation in its entirety.

The four major decisions to which I wish to refer cover, first, the policy laid down with the initial establishment of ceiling prices for wood pulp. The spiraling prices brought on by the elimination of Scandinavian wood pulp imports necessitated action by Mr. Henderson's office and, in my judgment, the cooperative approach that was used at the time was due in no small degree to the ability and understanding of Mr. T. B. McCabe of the Scott Paper Company. The across-the-table discussions of the then existing situation with major producers were based upon two major considerations. First, the representatives of Mr. Henderson's office conceded that maximum production must be maintained and no price established that would not permit full operation of marginal capacity. Secondly, company by company, Mr. Henderson's representatives inquired if the then existing price would accomplish this objective and upon receiving an affirmative answer, each company was asked if it would refrain from further price increases without consultation with Mr. Henderson's office. That meeting, and the decisions reached, while they have been modified in many respects since that time, set a pattern that I believe reflected credit on the industry and certainly on the men representing the Government in the discussion.

Wood Inventories an Important Factor

The second major difficulty that had to be surmounted was the apparent total lack of recognition of the fundamental problem of maintenance of adequate inventories of wood if pulp requirements were to be met. Since the fundamental difficulty in maintaining the wood supply rested with the shortage of manpower and equipment, and since at the outset there was little inclination to recognize paper and paper products as essential, this difficulty seemed at times almost insurmountable. Several steps were taken. The cooperation of the publishers was asked in the initiation of a national campaign to encourage pulpwood production. This campaign is still effective and certainly still vitally needed. It is now receiving support from many sources. Second, after great difficulty, pulpwood cutters were given an essential rating which had a marked effect upon the output of farm-labor produced wood. Third, the industry brought strong arguments into the foreground in order to have established in the Pulp and Paper Branch of the War Production Board a Pulpwood Division, headed by a qualified executive. The final establishment of this division and the centralizing of responsibility in it for the maintenance of adequate wood supplies, in my opinion, contributed as much as any action taken to the maintenance and improvement of pulpwood, pulp and paper production. The industry owes a debt of gratitude to the men who assumed the responsibility for this undertaking and to the effective work that they have accomplished. Fourth, it took consistent pressure and strong arguments to inject the production of pulpwood as a part of the program of the Timber Production War Project, which was and is supported by an appropriation of one million dollars of Federal funds. While the effectiveness of this project is not subject to close measurement, there is no doubt that it has played a considerable part in

(Continued on page 18)

Pulpwood Key to Canadian Pulp Production

Prospects Indicate Dominion's Industry Will Operate At Current Rate For This Year—Good Progress Now Made In Wood Cutting, — More Newsprint For Overseas — Other Late Industrial News.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., January 8, 1945—As far into 1945 as one can see at the moment, the volume of business for Canadian pulp and paper products is likely to be limited only by the available supply of pulpwood. This in turn will depend on the result of wood-cutting operations throughout eastern Canada during the winter months and on conditions next spring in driving the wood down the rivers to the mills. Such is the opinion expressed by Charles Vining, chairman of the Joint Executive Board of the Newsprint Association of Canada and the Canadian Pulp and Paper Association. Present possibilities, he further says, are that the industry as a whole will continue to operate at about the current rate (which is considerably below full mill capacity) in the first half of 1945, with some improvement in the second half, dependent on whether or not the expected increase in the pulpwood supply materializes. In any case, he believes demand is likely to continue substantially in excess of available supply throughout 1945, especially for Canadian exports of newsprint and pulps.

Good Progress in Wood Cutting

Pulpwood operations continue to go ahead full swing in many localities, due to the much larger supply of bush workers, and substantially larger supplies of raw pulpwood continue to be predicted for 1945, as compared with 1944. So far weather conditions have been favorable. Heavy snowfalls during the past few weeks have so far not interfered materially with operations—in fact, have improved them so far as hauling is concerned. The snowfall to date, however, is heavier than last year up till this time, and if it continues at the present rate it may make it impossible or impracticable to cut the stumps low enough to conform with government regulations. So far governmental authorities are unwilling to concede that the expected increase in raw materials will mean that more newsprint will be released to users in Canada. It is pointed out that a very large percentage of Canada's newsprint production is earmarked for export to the United States, and that paper quotas are a matter for negotiation.

As regards the number of workers cutting lumber for all purposes, the federal Labor Department states that there is a distinct possibility that 25 per cent more will be cut this season than in the preceding 12 months. "This does not mean that lumber will be more plentiful in Canada in 1945," a spokesman said. "We have to think not only in terms of houses for Canadians, but of houses for Britain to replace those destroyed by bombs. Canadian lumber is also going to Italy for use in some of the destroyed or half-destroyed towns. No less than 50,000,000 board feet of Canadian lumber were required for military and other purposes in a single town in Italy."

Newsprint for Overseas

As the process of liberation of Allied countries in Europe proceeds, the pressure of demands for the shipment of more newsprint overseas becomes more insistent. From a low of 83,479 tons shipped overseas in 1942, the total shipments rose last year to 131,833 tons, and up till the end of November last this total had already been exceeded by close to 20,000 tons. It now looks as though, when the December figures are in, the total for the calendar year will have risen to pretty nearly the same amount as was shipped in the last pre-war year (1939), namely 175,000 tons.

Tree Diseases Make Inroads

Great inroads on the forest reserves of eastern Canada continue to be made by insect pests and various forms of tree diseases. How these affect the province of Quebec is shown by the statement of the provincial Minister of Lands and Forests, who estimated that 50% of the trees on the North Shore of the St. Lawrence are "sick." He has announced a vigorous and intensive program for dealing with tree diseases, and in supporting this program the Hon. Paul Beaulieu, provincial Minister of Trade and Commerce, says that on the forests and power resources of the province depends the prosperity of its people. He expects both to contribute far more than in the past to the progress of the province, in view of the fact that the world has now entered on a "plastic age," and that Quebec is so plentifully endowed with the two main essentials for the manufacture of plastics, namely wood and water power.

Employment of Disabled Veterans

The pulp and paper industry is doing its full share with other industries in co-operating with the federal authorities in placing disabled war veterans in jobs where, in the words of the supervisor of the casualty section, their efficiency will be 100 per cent. To date more than 1,300 amputation cases and 55 blind cases of this war have been returned successfully to civil life. In making known these facts a despatch from Ottawa cites some disability cases as examples. Among them is the following: Capt. Allan Piper, a former employee of the Howard Smith Paper Mills at Cornwall, Ont., lost both hands in retrieving a loose grenade which exploded as he attempted to hurl it out of danger. Using special mechanical fingers, operated by shoulder movements, he is now back in the employ of the Howard Smith mills as plant supervisor—a better job than he held at the same plant before the war.

Ukraine Paper Industry Resumes

The first part of the paper and wood pulp combine at Ponika, in the Ukraine, had been reconstructed and was expecting to turn out, during September, approximately 5,000,000 copy-books as well as a considerable tonnage of paper and cardboard, says a report to the Department of Commerce.

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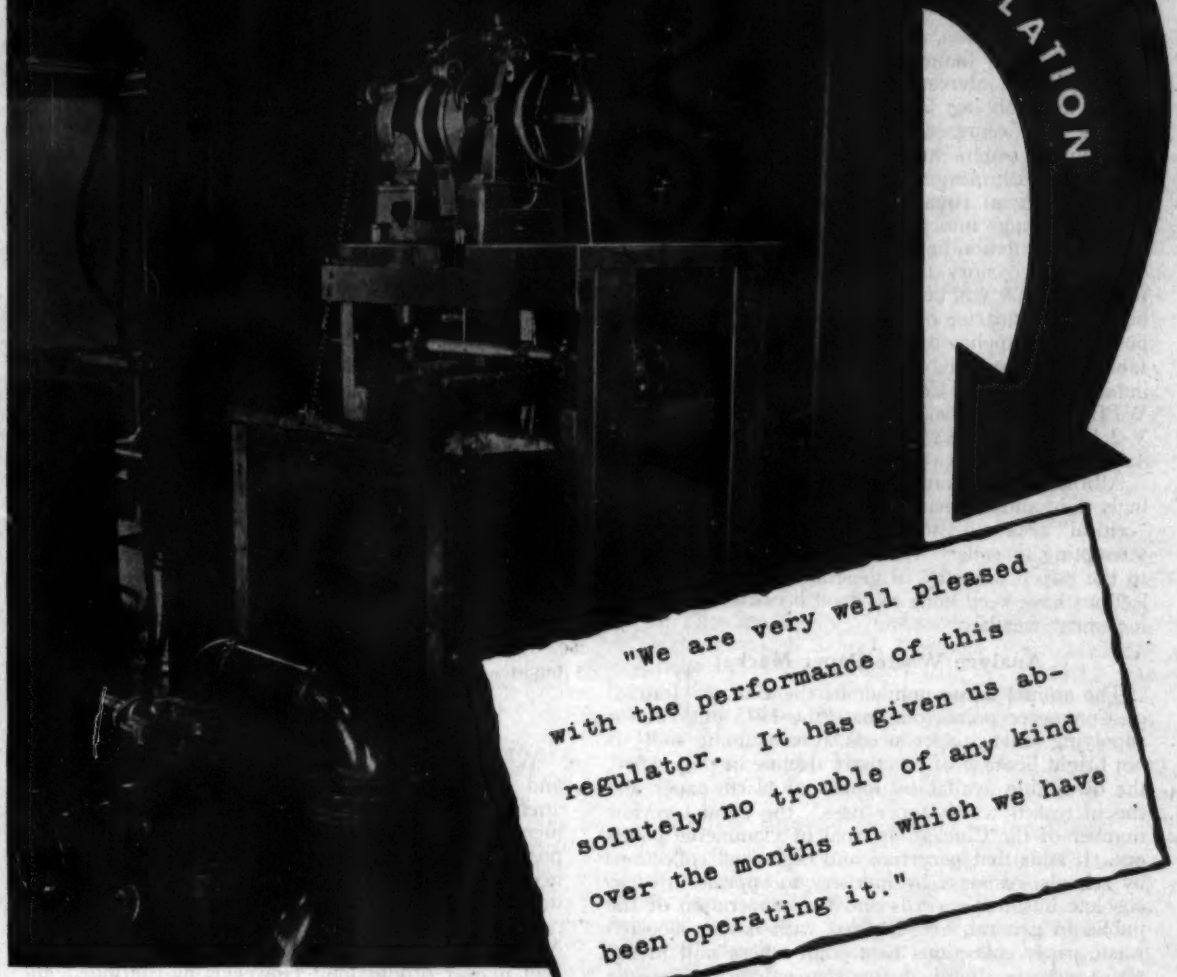

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Paper and Manpower Situations Critical

Increasing Difficulty of Transacting Business Increases Concern of Midwest Paper Merchants As To Future—Salesmen Plan To Visit New York—Analyzes Waste Paper Situation—Other Late News.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., January 8, 1945—Life in the paper industry is an interesting one, as a survey of paper selling and jobbing firms reveals. The former, including mill representatives are mostly busy with government orders and with attempting to satisfy customers with meager civilian stocks available. The latter are in an equally uncomfortable spot as the industry swings into its fourth war year.

Local circulation has been given of the Department of Commerce story that shortages in paper supply for civilian use will become progressively tighter during the first quarter of 1946. Because of the critical position of supplies of pulp and labor, for container fabrication, the boxboard, folding and set-up box industry Advisory Committee has recommended to WPB that L-239 be kept in its present form until V-2 Day and order M-378 for some time after such date.

All lines of "military papers" are reported increasingly tight and the manpower situation in the Chicago "critical" area is giving real concern not only to those attempting to collect waste paper and process it but to the paper industry in general. Waste paper collections have been none too good because of the very inclement weather.

Analyze Waste Paper Market

The annual revue number of the Chicago Journal of Commerce points out that "the 1945 outlook for supplying waste paper needs at consuming mills is not bright because of the sharp decline in pulp wood, the dwindling available supplies of waste paper and the increased waste paper uses," the annual review number of the Chicago Journal of Commerce points out. It adds that perpetual and organized collections by schools, response by industry to appeals to scrap obsolete business records and the cooperation of the public in general, are credited with having boosted waste paper collections to a point where mill inventories were in slightly better shape than at this time last year. A year ago, it was necessary for several mills to shut down for lack of raw materials.

"Nevertheless," the statement added, "as the year started, trade sources were emphasizing the fact that not only newsprint but all grades would be in critical demand for the duration. Perhaps the high point of interest in the waste paper field in 1944 was the revision of waste paper prices, effective July 17, which was the first price change allowed by OPA since controlled prices went into effect. This revision, which permitted packers of bales of 500 pounds or more an increase of $5 a ton on waste paper, brought such a protest from small dealers that again in September, the ceiling was revised to lift these baling restrictions and to allow the increase on all baled paper, regardless of weight."

Salvage Head Resigns

William M. Scanlan, middle west manager for the War Production Board, with headquarters in Chicago, and well known to many local paper trade men, has resigned after serving the Washington and Chicago offices of WPB for the last two years. He will become general sales manager of the R. S. McMahon Company of Chicago, with territory in the eleven counties surrounding Chicago. In the last year Mr. Scanlan directed the WPB's waste paper collection drive in conjunction with the Chicago Newspaper Publishers Association and was credited with spearheading the campaign in the Chicago area which was so successful as to attract nationwide attention.

Salesman Heads Plan N. Y. Trip

Burt Fisher, president and "Pat" Patterson, western vice president of the Salesmens Association of the Paper Industry are, at this report, the only two sales executives who will attend the war time SAPEYE and APPA and NPTA meetings in New York on February 19. Without any formal program, and because of travel restrictions, the remainder of the usually large crowd will stay at home. Only a scattering of officials of the various Associations will make the trip and then only for board and executive committee sessions. The western division of the SAPEYES held no meeting this week because of New Years but resumes its Monday noon schedule at the Hotel Sherman on January 8 with a routine business discussion.

Outlines Post-War Plan

William A. Barr, president of Foote Brothers Gear and Machine Corporation, Chicago, at a dinner attended by 400 executives, superintendents, and foremen of the company on November 30, outlined the post-war plans of the company and emphasized the need for continued high-speed production of urgently needed war materials.

Prefacing his remarks concerning reconversion, Mr. Barr said that Foote Brothers is engaged 100 per cent in war production. However, he continued, the company has been manufacturing its normal line of products—including precision and industrial gears, speed reducers and aircraft devices—and will consequently have a broad base of experience of which to build its post-war business.

The Foote Brothers president also introduced Admiral William Harrison Standley, former U. S. ambassador to Russia, who, speaking on the subject of our post-war relation with the Soviet Union, declared that signs point to a mutually fruitfull era of post-war collaboration between the United States and Russia. He added that in his opinion the demands of the Russian people for consumer goods will become effective immediately upon the restoration of peace, but that rehabilitation will delay the fulfillment of those needs.

"Without American products," he said, "the Soviet Union will be unable to realize her peacetime goals. America can not only supply a large share of the Russian wants but will find them a fortunate outlet for heavy surpluses."

F. J. Sensenbrenner Retires As Chairman

Relinquished Active Duties With Kimberly-Clark Corp. On January 1 After Serving Concern More Than 55 Years — Completes Ordnance Contract—Gives Labor Certifications—Other Late News.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., January 8, 1945—Kimberly-Clark Corporation, Neenah, Wis., announced Wednesday, January 3, that F. J. Sensenbrenner had retired from active service, effective January 1 of this year, after more than 55 years of service with the company.

Mr. Sensenbrenner entered the service of the company in February, 1889. In 1942, he resigned as president and was elected chairman of the board. Having recently reached his eightieth birthday, he decided to sever his active connections with the business and to devote the major part of his time to his public interests and his private affairs. He remains a director of the corporation.

Mr. Sensenbrenner is regarded as one of the country's outstanding experts in paper manufacturing. He received his training in the paper manufacturing business under the four founders of the corporation, J. A. Kimberly, C. B. Clark, F. C. Shattuck and Havilah Babcock.

In 1907 he was general manager and first vice president of the concern, and he succeeded to the presidency in 1926 at the death of Mr. Kimberly.

In 1920 he and Adolph S. Ochs, the late publisher of *The New York Times*, joined to organize the Spruce Falls Power and Paper Company, which created a town in the wilderness on the main line of the Canadian National Railway, seventy miles west of Cochrane, and there built a paper mill with supporting pulp making equipment.

He is a member of the board of regents of the University of Wisconsin, a member of the board of governors of Marquette University, a trustee of Lawrence College, a trustee and member of the executive committee of the Northwestern Mutual Life Insurance Company, and is active in other public and educational circles.

Completes Army Ordnance Contract

Kimberly-Clark Corporation's ordnance contract with the United States Army was completed December 31, 1944, after production of 6,073 gun mounts, with 278 of that number being 2-gun mounts and 5,795 mounting four 50-caliber guns.

The corporation's ordnance division was set up in July, 1942, when the contract was awarded. Production began January 1, 1943, after a six-month period devoted to tooling up, requiring a large number of sub-contracts, from New York City and Atlanta, Ga., to Denver, Colo. Purchases were made from 1,170 different companies in the execution of the contract.

Contracts were also handled for the repair of damaged mounts and spare parts. The division also compiled a detailed manual for the operation and maintenance of the mounts, and conducted a training school for officers and enlisted men whose responsibility it was to maintain and repair the mounts in the field. Men who attended the school now are scattered over the world, and their reports indicate that the mounts have done a creditable job under battle conditions.

In November, 1943, the peak employment period, 432 persons were employed, of whom 102 were women. The ordnance division is in the Kimlark plant, on the south edge of the city of Neenah. Several thousand persons were employed by the sub-contracting units.

The corporation received the ordnance banner for production records during a ceremony on May 18, 1943, and on June 20, 1944, the company and employes were awarded the Army-Navy E.

R. F. Bellack Made Lt. Col.

Announcement has been made of the promotion of R. F. Bellack to the rank of lieutenant colonel. He is in his second year with the allied military government in Europe. Since his enlistment, he resigned as executive vice-president of the Fox River Paper Corporation, Appleton, Wis. In his place, Paul C. Wesco, who had been sales manager and for the last year a vice president, was elected to the board.

Twin City Safety Council to Meet

An eye-witness lecture on the South Pacific war will be given by Jack Major, Paducah, Ky., at the first of two meetings of the Twin City Safety Council on Tuesday evening, January 9, in the auditorium of Menasha High School, Menasha, Wis. Mr. Major, who holds the honorary title of "colonel," was sent to the South Pacific by the special service department of the United States Army to entertain the boys.

G. E. Mortensen, safety director of the Kimberly-Clark Corporation, Neenah, Wis., will speak on "Keeping the Home Front Safe."

Retires Under Company Pension Plan

Fred Kranhold, who has been with Kimberly-Clark Corporation, Neenah, Wis., for nearly 54 years, has retired, effective January 1, it was announced last week, under the corporation's recently approved pension retirement program. He entered the service of the company in 1891, and during the last 30 years has held positions of top line and staff responsibility in the manufacturing departments. He will be on call in an advisory capacity to help solve problems where his rich background of practical operation is required.

Labor Board Announces Certifications

The International Printing Pressmen and Assistants Union (AFL) has been certified by the National Labor Relations Board as collective bargaining representative of shop employes of the George Banta Publishing Company at Menasha, Wis., the NLRB announced last week. Thirty employes voted for the union, and 26 opposed it.

In another case involving the Kimberly-Clark Corporation, NLRB announced a supplemental finding of fact by which all color mixers and machine printers in the Atlas-Kimlark Appleton division chose to be represented for collective bargaining by the Wall Paper Workers Union of the Fox River Valley, and joined employes already represented by that union. The vote in the latter case was 6 to 2.

Moves Paper Mill from U. S. to Venezuela

"Moving an entire factory from Unionville, Conn., to Caracas, Venezuela, South America and setting it up with only local, unskilled help, was the recent undertaking of George Forman, who has returned from this 13-month engineering contract," says Mabel S. Hurlburt in a recent issue of the *Farmington Valley Herald.*

Transportation Difficulties

"Mr. Forman, who had been in charge of the Unionville Box Board Company in Unionville, was requested by the new owners, the Elias Issa & Hon of Caracas, to dismantle, transport and reestablish the paper mill which they had purchased from the Unionville Company. In time of war, the matter of transportation had its difficulties. Boats could not be obtained at New York and it was necessary to ship the machinery by railroad to New Orleans, where it was carried by boat to Venezuela.

GEORGE J. FORMAN

"There again, transportation difficulties loomed, as Caracas is situated 3500 feet above sea level and is reached only by a long twisting road. A narrow gauge railroad which runs to Caracas, could not take the machinery and it was necessary to use mules.

No Skilled Help Available

"No skilled help was to be obtained and Mr. Forman found it necesary to educate some of the men as they went along. This paper mill is the only one in Venezuela. It was built outside the city which has a population of about 350,000. Most of the residents are either very poor or very wealthy. The poor are uneducated, but intelligent, Mr. Forman said and respond quickly to instruction. The wealthy of the city make their money in oil, gold, silver and other mines for which the locality is famed. They sell the material at high prices, which keeps the cost of living high, but in reverse, keeps the standard of living low.

Mill Employs About 100 Men

"This first paper mill to be set up cost the new owners $45,000, for transportation before any other work was begun. But now that the mill is in operation, costs of producing the paper, which was previously purchased from the United States, have dropped to about one-third and produce an excellent profit. About 100 men are employed at the mill.

"No derricks or other machinery was available for the erection of the new mill, all the work being done by hand labor. Walls for the mill and the machinery were set up at the same time. Eight months from the day of their arrival there found the mill ready for operation. Engineers were trained by Mr. Forman to start the engines, get up steam and start the operation of the paper for boxes.

Country Rich in Natural Resources

"Mr. Forman says the country is rich in natural resources. The gold standard still is in effect there. Houses of Spanish type architecture are made of colored tile laid in brick and cement. They are built in the mountains surrounding the city and sumptuously furnished. The weather there is uniform, remaining at about 70 degrees throughout the year. Bull fights are one of the main entertainments. Pictures brought back by Mr. Forman show the city in the mountains, some of the homes, the old narrow part of the city, and several views of various stages of a bull fight with a pretty girl victorious over the tired bull.

"Offers to remain with the firm were declined by Mr. Forman, who still prefers to live in Farmington."

Changes in Crane Co. Personnel

Effective January 1, Crane Company announces important changes in the management of its branches, due to the retirement of two of its branch managers of long standing.

In Los Angeles, D. D. Updegraff, manager since May 1, 1936, has resigned on the advice of his physician to take a well-earned, and needed rest. He is a man of outstanding ability and character, affectionately regarded both inside the organization, and among the trade, all of whom hope he will have a speedy and pleasant journey on the road to vigorous health.

Mr. Updegraff is succeeded by R. E. Penny, manager of Jacksonville branch since 1941. Mr. Penny is no stranger to the Pacific coast because he was formerly manager at San Bernardino (1935) and Phoenix (1938) before going to Jacksonville.

L. R. Bauer, who served as manager at Brooklyn and New Haven, now goes to Jacksonville to succeed Mr. Penny. J. J. Murray, once manager at Worcester, and more recently a planning department analyst at the Chicago works, is appointed manager at New Haven.

In Memphis, Tenn., F. A. Duncan—manager since April 1, 1922, retires after 43 years of loyal service. He joined the Crane organization October 1, 1901 at St. Louis, moved to Memphis in 1905, and has been there ever since. All who know him wish him continued health and good cheer in the leisure years ahead.

He is succeeded by O. F. Woodyard, former manager at Little Rock, Ark. who, in turn is followed by A. C. Gribble, who was a salesman at the Houston branch.

Superior Products Co. Dissolved

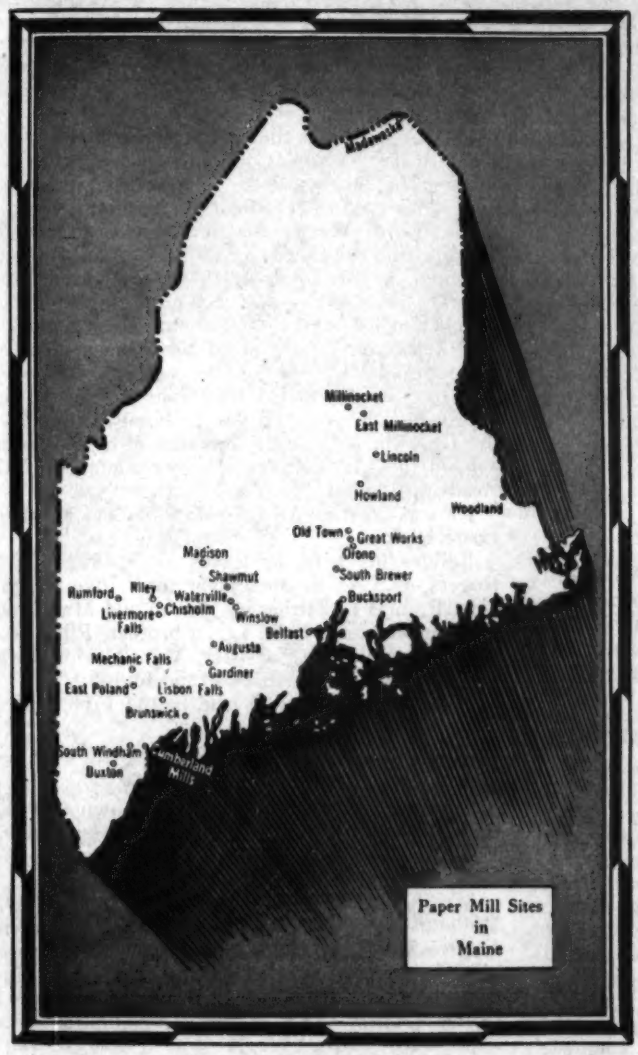
[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., January 8, 1945—Officials of the Superior Paper Products Company, Marion, Ind., have filed papers with the Indiana secretary of state evidencing the final dissolution of the corporation.

Draper's

ATLAS OF AMERICAN PAPERMAKING

No. 2 PUBLISHED BY DRAPER BROTHERS COMPANY • CANTON, MASSACHUSETTS



Map copyright by L. D. Post, Inc., New York. American Map Co., N. Y.

HIGH LIGHTS:

Maine's first paper mill was established at Falmouth about 1734, by Samuel Waldo and Thomas Westbrook, and it was first operated by Richard Fry, a papermaker from England.

The State of Maine ranks first in the quantity of wood pulp production, and third in the production of paper.

The University of Maine established the first regular four year curriculum in Pulp and Paper Technology in America. This course was begun in the year 1913.

Maine has 24 paper mills and 30 pulp mills; 83 Fourdriniers, 3 cylinder machines and 85 wet machines. Principal products, book paper, newsprint, wrapping papers, ground wood pulp, sulphite, sulphate and soda pulp.

Draper Felts for Efficiency

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Obituary

Mary Louise MacDonald

Mary Louise (Brantingham) Macdonald, wife of George S. Macdonald, president of the Lockwood Trade Journal Company, 79 Sutton Manor, New Rochelle, N. Y., died Saturday, January 6, after a protracted illness at the age of 76 years. Funeral services were held at the Moravian Church at New Dorp, Staten Island on Monday of this week. The funeral was private.

Mrs. Macdonald lived in New Rochelle since 1893, with the exception of 1895 and 1896, when she resided in New York City. She has resided in Sutton Manor since May, 1912, when her present home was completed.

Mrs. Macdonald is survived by her husband, George S. Macdonald, her daughter, Blanche Macdonald Lockwood, wife of Henry A. Lockwood, residing in Scarsdale, and by her son, Allan Freeman Macdonald, of Petersville road, New Rochelle, and by four grandsons, George E. Lockwood, vice-president and treasurer of the Lockwood Trade Journal Company, of 2 Harmony drive, Larchmont, Henry A. Lockwood, of Honolulu, T. H., Lt. Allan F. Macdonald, Jr., U. S. A. and Gordon Macdonald, U. S. N., and also by four great-grandchildren, Katherine R. Lockwood, Jr., Barbara Louise Lockwood, George E. Lockwood, Jr., daughters and son of George E. and Katherine Morris Lockwood, and Allan F. Macdonald 3rd, son of Lt. A. F. Macdonald, Jr., and Helen Howell Macdonald.

Mrs. Macdonald was a member of the Dutch Reformed Church.

W. B. Powell

William Bleecker Powell, president of Appleford Paper Products Ltd., Hamilton, Canada, prominent churchman and Mason, first vice-president of the Chamber of Commerce and former president of the Red Cross Society of Hamilton, died last night in the General Hospital in his 63rd year. Mr. Powell had been ill for some weeks but his sudden passing was a shock to the community he served so well for a quarter of a century.

Mr. Powell was born in Guelph, April 30, 1882, the son of John B. and Helen Powell. He was educated at Guelph Collegiate Institute and upon graduation was with the Imperial Bank at Fergus, Ingersoll, Toronto, Sault Ste. Marie, Niagara Falls, Essex and Galt, where he was manager.

In December, 1921, he became sales manager of McCaskey Systems Ltd., Galt, and was appointed general manager of Appleford Paper Products in January, 1923. He became president of the company in 1937.

Mr. Powell was president also of Aridor Limited, and a director of the Mutual Life Assurance Company and of many other concerns.

In Hamilton since 1923, Mr. Powell had assisted in the promotion of scores of plans for the expansion and improvement of his adopted city.

Mr. Powell was a member of Alma Lodge, Galt; Acacia Lodge, Hamilton; was a past first principal of Walter Chapter, Royal Arch Masons, and a 32nd degree member, Scottish Rite.

Mr. Powell was a member of the Hamilton Club, Thistle Club, Hamilton Golf and Country Club, Waterloo Golf and Country Club, Toronto Club, York Club, Granite Club, Toronto; Tamahaac Club and Mount Stephen Club. He had been a member of the Toronto Board of Trade for a number of years.

Surviving are his wife, Yolande Y. Powell; two daughters, Mrs. Hubert A. Martin and Miss Yolande W. Powell, and two grandchildren, Rosalind Joan Martin and Joyce Elizabeth Martin, all of Hamilton.

Services were held in All Saints Church and burial was in Woodland Cemetery.

Leon B. Rogers

Leon B. Rogers, 65, treasurer of the Rogers Fibre Company, Inc., Boston, Mass.; Kennebunk, Me.; Bar Mills, Me., and East Poland, Me., died at the Newton Hospital, Newton, Mass., December 30.

Mr. Rogers had served as president of the Brae Burn Country Club 16 years until he retired last November.

He also served as the first president and first chairman of the Newton Community Chest. He was a member of the board of aldermen for many years and had served as chairman of the finance committee of the board. He also had served as chairman of the fund-raising committee for the erection of the Newton Hospital, as president of the Newton Hospital, as director of the Newton Savings Bank and as a member of the mayor's relief committee during 1932. He was a past president of the Newton Taxpayers Association, and one of the original members of Selective Service Board 122, from which he resigned because of illness. He was an honorary member of the Brae Burn Country Club and also held membership in the Masons. He was a graduate of Phillips Academy, Andover.

He was born in Allston, Mass., where he attended grade schools.

Besides his wife, he leaves a son, Capt. Richard Rogers, U.S.A., in the Pacific area; two daughters, Mrs. Francis B. Turner of Waban and Mrs. Baldwin Pearson of Camp Polk, Lt.; a brother, Elliot Rogers of Kennebunk, Me.; a sister, Mrs. Marion Leonard of Auburndale, and three grandchildren.

Funeral services were held at the First Unitarian Church, West Newton, Mass.

Edward D. Kingsley

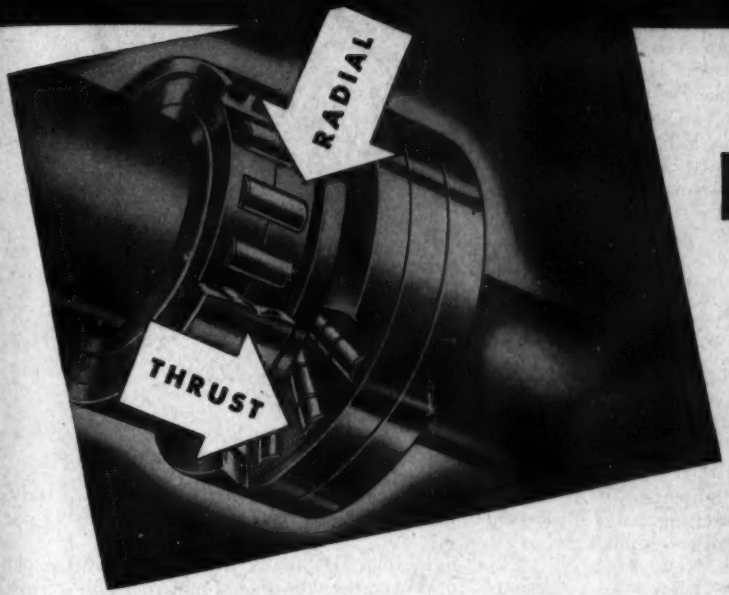
Edward Dickson Kingsley, well known as a chemical industrialist, died of natural causes at his New York residence, Mayfair House, Park avenue at 65th street, on January 1, at the age of 84.

Mr. Kingsley was born on March 14, 1860, in Williamsburg, Mass. Early in 1907, he organized the Electro Bleaching Gas Company for the purpose of manufacturing and distributing liquid chlorine, a compressed gas which was a new product at the time in this country and a chemical contribution of wide importance during World War I and during the succeeding years.

This modest start in the chemical field was the forerunner of his acquiring in 1915 the Niagara Alkali Company of Niagara Falls, N. Y., which produced a line of heavy chemicals, and later the Pacific Lime Company, Ltd. of Canada, Kingsley Navigation Company, Ltd. of Canada, and the Kingsley Navigation Company of California. These companies he headed as president until 1941 when he became chairman of the board of directors of Niagara Alkali Company.

Mr. Kingsley married Emma F. Scheffler in New

Are Bearings the LIMITING FACTOR In YOUR Postwar *Design & Production*



Specify ROLLWAY *Right-Angle* LOADING *for*

1. Longer machine life
2. Greater machine efficiency
3. Less maintenance care

Whether your job is to re-design old products or to develop new ones, it breaks down into two phases:

1. **To design competitive sales appeal into the product; i.e., longer life, higher efficiency, and lower maintenance costs.**
2. **And to design or change-over production machinery for heavier loads, or higher speeds with less time out for service.**

In both of these, bearings are often the limiting factor. That's why Rollway's right-angle loading is so important. Right-angle loading insures that only simple loads are ever brought to bear on a single bearing. It automatically splits compound loads into pure radial and pure thrust . . . carries the radial load on a radial bearing, the thrust component on a thrust bearing . . . *both at right angles to the roller axis.* Oblique loads and their resultants are never introduced.

That means greater carrying capacity in given dimensional limits . . . or higher speed . . . or longer life . . . or proportional combinations of all three. It means lighter, more compact design . . . with firmer control over the distribution of stresses.

•

Proper Bearing Selection is a Specialist's Job; Let Rollway Engineers Help You

Just send a drawing or detailed statement of your problem and let our free Advisory Engineering Service help you in selecting the most efficient Rollway Bearings for your new and replacement designs. No obligation.

ROLLWAY BEARING COMPANY, INC., SYRACUSE, NEW YORK

BUILDING HEAVY-DUTY BEARINGS SINCE 1908 — BEARINGS

SALES OFFICES: Philadelphia • Boston • Pittsburgh • Youngstown • Cleveland • Detroit • Chicago • St. Paul • Houston • Tulsa • Los Angeles

York in 1922 and since that time has made his home at Cappaqua, N. Y.

He was a member of The Chemists' Club, the Niagara Club of Niagara Falls, N. Y., the American Chemical Society, and the Electrochemical Society. He is survived by his widow.

Howard M. Wylie

SOUTH NORWALK, Conn. — Howard McWilliam Wylie, former vice president in charge of sales of the Nash Engineering Company here, died on Christmas Day at his home, 51 Elmwood avenue, after a long illness. He was born in Poughkeepsie, N. Y., 59 years ago.

Mr. Wylie received a B.S. degree from New York University in 1906 and an M.E. in 1908. He had served as a design and erection engineer with the Westinghouse - Church - Kerr Company, an erection engineer with Bliss & Griffiths and the Wirebound Box Corporation, secretary of the Howard Automobile Company, design engineer for the Roland Gas and Electric Company and sales engineer for the Bishop-Babcock Company. In 1915 he joined the New York office of the Nash firm, which manufactures pumping equipment, as a sales engineer, and later became manager of the office.

In 1919 Mr. Wylie came to South Norwalk as general sales manager. He was elected a director in 1921, assistant secretary in 1922, and vice president in charge of sales the next year. Mr. Wylie retired as vice president and as director in 1942.

A Registered Professional Engineer in both New York and Connecticut, he was a member of the American Society of Mechanical Engineers, the American Society of Heating and Ventilating Engineers, the Connecticut Society of Professional Engineers, and the Engineers Club in New York City. He also belonged to the Zeta Psi Club.

Mr. Wylie leaves a widow, Mrs. Alice Hutchinson Wylie; a daughter, Miss Virginia Lawrence Wylie of New York and South Norwalk; a sister, Miss Jane D. Wylie of New York; and two brothers in the Army, Lieut. Col. David R. Wylie of Washington, D. C., a chaplain, and Major Robert S. Wylie, now overseas.

TAPPI Notes

The New England Section of the Technical Association of the Pulp and Paper Industry will meet at the Hotel Kimball, Springfield, Mass., on Friday, January 19, at 6:30 P.M. There will be a symposium on "Trends in Modern Paper Machine Design" in which the principal speakers will be Charles S. Adams, Rice Barton Corporation, Worcester, Mass., Leon Dunning, Reliance Electric and Engineering Company, Boston, Mass., and Peter S. Sinclair, the Sinclair Company, Holyoke, Mass.

The Hudson Valley Group of the Empire State Section will meet at the Queensbury Hotel, Glens Falls, N.Y., on Friday, January 19, at 6:30 P.M. R. F. Vokes of the Dilts Machine Company will talk on Post War Hydrafining Methods. This will be illustrated by a film showing the Hydrapulper in use.

The Chicago Professional Group will meet at the Chicago Bar Association, 29 S. La Salle street, Chicago, Ill., on Monday, January 15, at 6:00 P.M. This will be a social evening sponsored by several companies in Chicago.

Capt. L. D. Fish Is Promoted

BOSTON, Mass., January 8, 1945—Word has been received by the Charles A. Esty Paper Company, Worcester, Mass., of the promotion of Captain Lincoln D. Fish to the Headquarters where he is serving as Regimental Adjutant.

L. D. Fish is a former member of the Sales Organization of the Esty Division of Carter, Rice & Co., Worcester, which he left to join the Military Forces of the U. S. A. about three years ago. Since that time he has served as a Captain of Infantry

GEN. EISENHOWER INTERVIEWING CAPT. FISH

through the important campaigns of Africa, Italy, Normandy, and now with General Hodges' First Army.

Captain Fish is frequently heard from by his old friends in Worcester who look forward to his return to the Esty Paper Company at the conclusion of hostilities.

Changes in J. & J. Rogers Personnel

John R. Rogers has been appointed to the Board of directors of the J. & J. Rogers Company, to fill the vacancy caused by the death of Robert Caldwell.

At a recent meeting of the board of directors, James Rogers II was elected vice president and general superintendent, and E. C. D. Cameron, vice president and secretary-treasurer. At the same time John R. Rogers was named paper mill superintendent, and Paul J. Beattie, sulphate mill superintendent.

Mr. Cameron served as Major with the Australian Expeditionary Force in World War I, joining Price, Waterhouse & Co. at the conclusion of the war. He left Price, Waterhouse & Co. in 1924 to assume the position of controller with the J. & J. Rogers Company. In 1929 he became treasurer, and in 1931, secretary-treasurer.

James Rogers II was made sulphite mill superintendent upon his graduation from Cornell University in 1925, and held that position until 1931, when he became paper mill assistant superintendent. In 1934 he was made superintendent.

John R. Rogers became asssitant superintendent of the sulphite mill upon leaving Union College in 1928, becoming sulphite mill superintendent in 1931.

Paul J. Beattie has been assistant sulphite mill superintendent for the last five years, having been with the J. & J. Rogers Company since 1933.

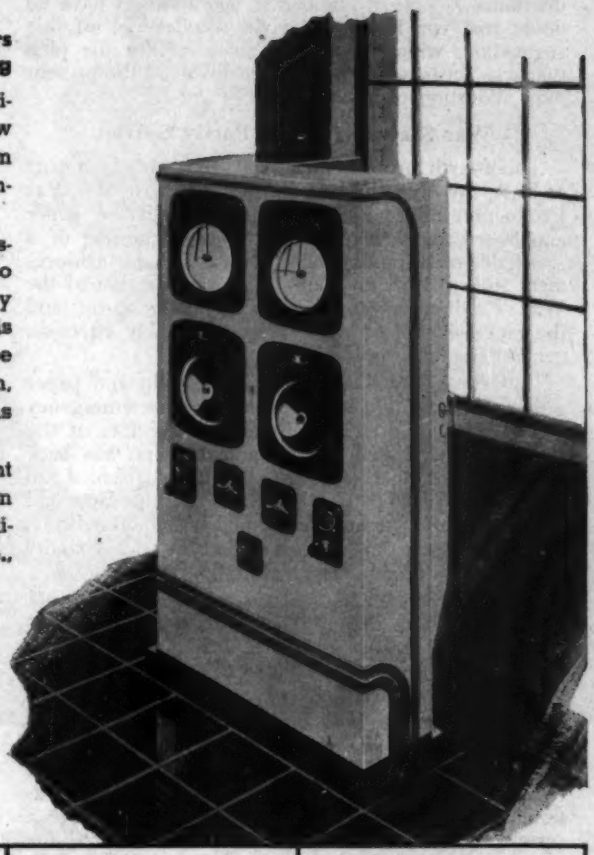
The Last Word, IN AUTOMATIC CONTROL FOR SULPHITE DIGESTERS!

New compact Universal Control System offers new high quality and economy in pulp cooking

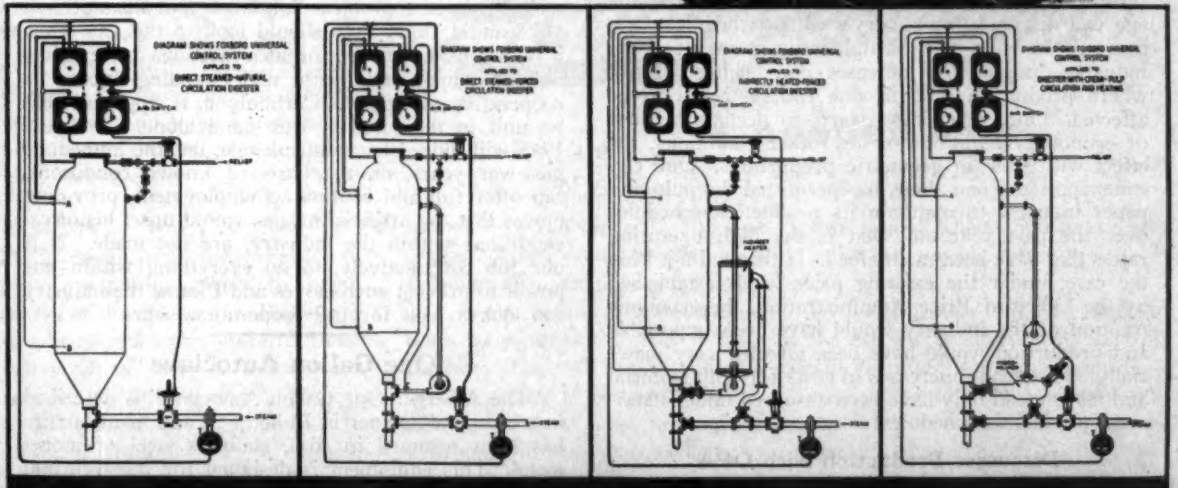
From more than 20 years of down-to-earth experience in pulp-cooking instrumentation, Foxboro now has developed a complete "packaged" control system that sets a new high in combined performance, convenience and versatility.

Unaided, the new Foxboro Universal Control System regulates digester heat input and gas relief so that cooking pressure and temperature follow exactly prescribed schedules from start to finish. Further, this efficient modern unit is equally suitable for any type of sulphite digester – natural or forced circulation, direct-steamed or externally-heated. (See diagrams below.)

Write for detailed information on this important advance in sulphite digester control. Also data on similar "packaged" control systems for alkaline digesters. **The Foxboro Company, 158 Neponset Ave., Foxboro Massachusetts, U. S. A.**



Foxboro Automatic Digester Control Unit. Supplied complete with following instruments ready-mounted in a modern protective steel cabinet: 1. Foxboro Steam Flow and Liquid Level Recorder with Steam Flow Integrator (top left); 2. Foxboro Dynalog (electronic) Three-Point Temperature and Top Pressure Recorder (top right); 3. Foxboro Cam Schedule Pressure Controller (lower left); 4. Foxboro Cam Schedule Steaming Controller (lower right).



FOXBORO
REG. U. S. PAT. OFF.

AUTOMATIC
DIGESTER CONTROL

OUTLOOK FOR PAPER INDUSTRY IN 1945

(Continued from page 7)

the maintenance of wood production over the past year and a half.

The third startling proposal that might have assumed the proportions of a catastrophe for many companies and mills involved the plan for concentrating production in a limited number of operations. I have no doubt that you have very vivid recollections of this suggestion, which is in sharp contrast to the plan that was actually adopted, which involved the present pulp allocation program.

War Status of Paper Partly Solved

The fourth problem that has been solved, in part at least, involved the lack of recognition in the War Production Board itself of the essentiality of paper and board to the war economy. The attaining of a justifiable status and recognition was a major achievement since it brought about the reorganization of the War Production Board administrative set-up and the establishment of the present reasonably effective, general organizational plan.

I presume it will appear that the pulp and paper industry has muddled through the war emergency period, at least up to this time, but the fact of the matter is that specific and planned action has been taken to meet emergencies as they have arisen. I am certain that if effective presentation of the facts had not been made, the industry would be in a far different position than it is today and that the war economy would have suffered very materially.

You will appreciate, I am sure, that I have not mentioned many actions that were taken, such as reduction of basis weights, proposals for curtailment of production because of alleged excessive use of power, and the problem of use of critical materials.

With respect to 1945, no one can make prognostications that are not subject to many contingencies. The duration of the war itself is a major one. The requirements of the Foreign Economic Administration, in the immediate post-war period, will have a serious impact. Increase in the acute manpower shortage can disrupt the industry's entire schedule. It is perfectly obvious that the tightening economy of the industry due to cost increases is reaching a point where production will, in due course, begin to be affected. Once production starts to decline, because of economic conditions or any other conditions, the effect will grow in geometric proportions. One circumstance, and one alone, has permitted the pulp and paper industry to maintain its production schedules over the past year and that is the high operating ratios that have been maintained. If this had not been the case, under the existing price levels established by the Office of Price Administration, the economic position of the industry would have been impossible and production would have been affected very materially. The steady increases in costs for both material and labor could only have been absorbed under maximum production schedules.

Discusses Production with OPA

Very recently in discussing the production problem of the industry with Mr. Bowles of the Office of Price Administration, industry representatives pointed out the fact that the situation in which the industry now found itself was critical indeed. It was urged that the Office of Price Administration give the closest of attention to current trends in order that prompt action might be taken in order to maintain essential production. If this essential production is not maintained, because of uneconomic situations within the industry, it appeared to the industry representatives that a large part of the responsibility for any failure would rest upon the Office of Price Administration.

The following data will indicate the trend in cost-price relationship which must be recognized. The following increases from 1941 have occurred in the cost picture of the industry: average hourly earnings, 21.8%; weekly earnings, 43.3%. The labor cost per ton has increased an average of 35.5%.

Material costs, in the same period, have increased as follows: wood pulp prices, 13.1%; waste paper prices, 28%; pulpwood prices, 67%; and fibrous raw materials, 13.8%.

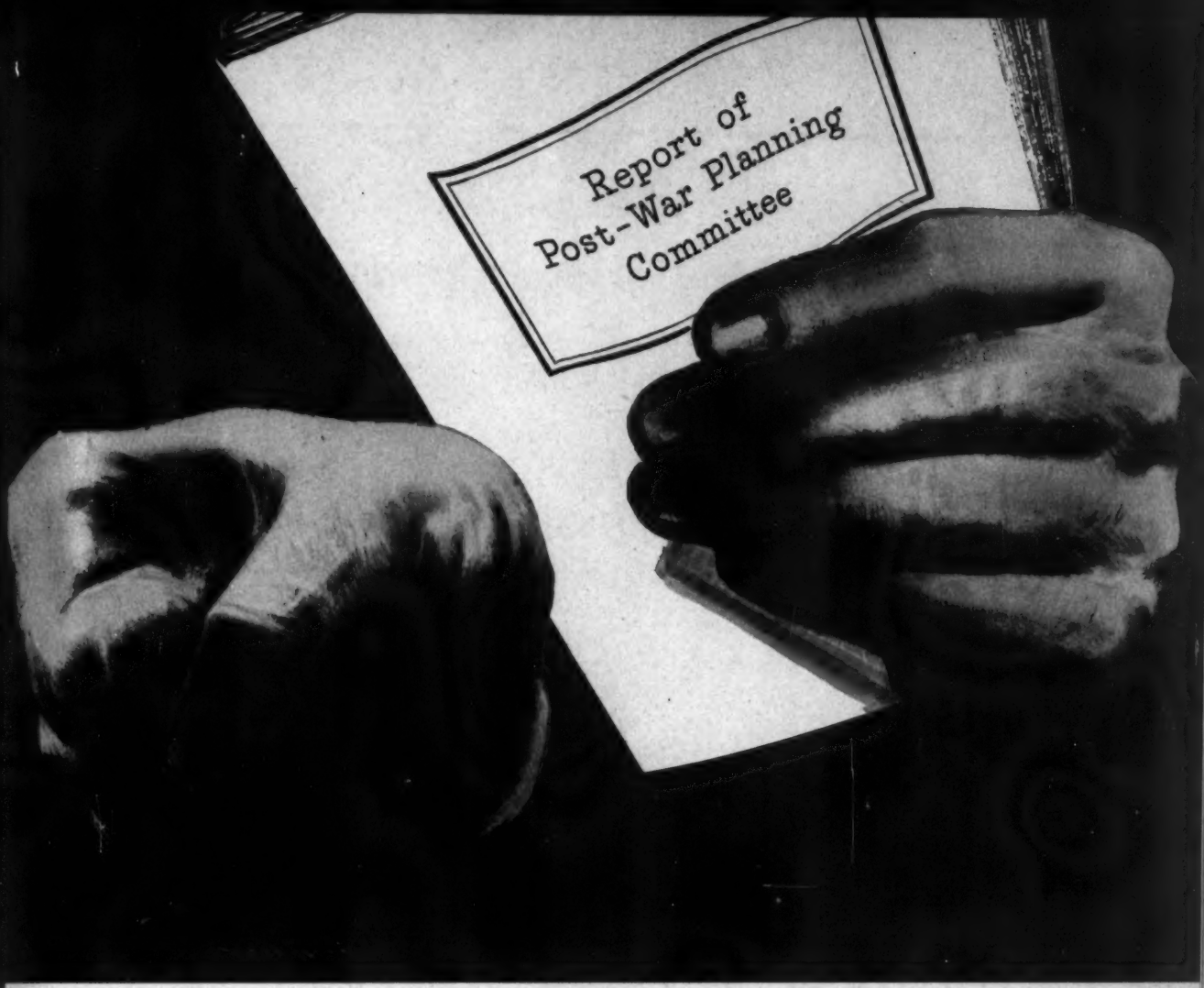
These data, in face of the fact that paper prices have in the same period increased only 4%, would indicate that if the trend continues production will inevitably be seriously affected, unless OPA is alert to the situation. One cannot view the outlook for 1945 with too much optimism unless these economic trends within the industry are recognized.

Related to this whole picture is the existing problems of maintenance of material requirements for the industry. Only by the use of every skill and every device has the pulpwood supply been maintained. At the present moment, in the South, the situation is indeed acute and production is already being affected. Available manpower on the basis of the present outlook will not be augmented, to say the least; in fact the probabilities are that it will decline. If this means a decline in the operating time of the industry, then it would appear probable that paper shortages, such as have not been conceived of in the past will occur.

The future of the pulp and paper industry on the basis of the demand outlook is good. The industry has the technical skills and the leadership. Its problem of loss of incentive for capital investment is not unique to this industry but covers other industries as well. This is a problem for labor and management alike and I think they should look to the day when it is so considered. Out of such meetings as this grow understanding and, with understanding, grows a cooperative viewpoint. Certainly it is apparent that no unit in the industry can stand alone. The year 1945 will indeed be a difficult one, but the immediate post-war years, on the basis of known conditions, can offer full and continuous employment, providing moves that, by artificial means, would upset historical conditions within the industry, are not made. It is our job conjunctively, to do everything within our power to prevent such moves and I know the industry can look to you for full cooperation.

One Gallon Autoclave

"The Alberger One Gallon Autoclave" is described in a complete manner in Bulletin 50 and manufacture has been resumed in iron, stainless steel or monel metal. This equipment is designed for research and plant control and simulates large plant units. Especially suited for digesting or cooking pulps and for other high pressure (up to 1000 lbs.) and temperature research. It is complete with jacket; stirrer equipment; safety valve, gauge, etc. Built by Industrial Machinery Company, Bloomfield, N. J.



What are you waiting for? The boys that are doing the big job over there, are depending on *you*—over here, to win the peace . . . America's *economic* reconversion is already under way and your business is a vital cog in this national machinery. You *are* America.

Action, gentlemen,

is needed now!

HERE'S HOW YOU CAN HELP . . . (1) Make an immediate analysis of your reasonable needs to begin post-war business. (2) Place unrated orders for this material to be delivered as soon as restrictions permit. (3) Advise your customers to do the same. (4) Keep up to date on W. P. B., and O. P. A. rulings.

HERE'S HOW IT WORKS . . . Unrated orders placed *now* permit your suppliers to anticipate your needs and begin actual production on them as soon as the W.P.B. lifts the bars. This will assure you of a quicker return to civilian business. The orders *your* customers place with you will provide a back-log to start you off when Uncle Sam ceases to be the one big buyer.

With all business following this plan the gap will be shortened—payrolls will be stabilized—returning veterans will find work—America will continue its job of supplying the markets of the world.

HEPPENSTALL, the most dependable name in chipper knives

Your personal war effort is important (1) Push production (2) Plan for peace (3) Beat 'em with bonds

HEPPENSTALL CO., PITTSBURGH 1, PA.

For bigger profits—decide now to move *bigger loads* in '45

For pointers on modern paper transportation and warehousing—

DIAL THE E-P MAN TODAY!

Albany	2-4095	Kansas City	VA 7021
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Charlotte	5026	Minneapolis	GE 3247
Chicago	SUP 7420	Montreal	HA 7191
Cincinnati	MA 0650	New York	COR 7-0797
Cleveland	MA 8915	New Orleans	MA 6316-C
Columbus	AD 4824	Philadelphia	LOM 3710
Denver	KE 5500	Pittsburgh	AT 6734
Detroit	MA 2233	St. Louis	LA 4545
Ft. Worth	4-6184	San Antonio	TR 3653
Greenville	534	San Francisco	GA 1827
Indianapolis	LI 3131	Seattle	EL 5722
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There was no precedent for the Roll-Handler for newsprint until Elwell-Parker developed the type shown above. *Always* when Paper Companies have reached their load-limit, Elwell-Parker has supplied more powerful equipment, or attachments to increase volume or speed.

You cannot avoid handling stock and other heavy loads again and again, but you can transport them in bigger Units, *faster, more safely.* You can tier them higher, reducing warehousing costs.

Call the E-P Man—your nearby Paper Transportation Advisor—into consultation now. Cash in on his experience, and ours, *before* you build or expand. He is as near as your telephone.

The Elwell-Parker Electric Company, 4500 St. Clair Avenue, Cleveland 14, Ohio.

"Unit-ize" for new profits in your Mill or Plant. Assemble the biggest loads you can put together—transport them on Elwell-Parker Truck and Crane Systems. See the E-P Man.

ELWELL-PARKER

POWER INDUSTRIAL TRUCKS

Cooper DENSICAST
STAINLESS CASTINGS

Superior grain refinement makes Cooper stainless castings stronger and more corrosion-resistant. And these important characteristics are secured without altering the chemical composition of standard analyses.

This is but one of many Cooper developments that have helped reduce the cost of casting replacements in sulphite-mill service. Cooper has made castings for the paper industry since 1928. Some of them are still in service. They stand up.

THE COOPER ALLOY FOUNDRY CO., 145 BLOY ST., HILLSIDE, N. J.

Cooper
STAINLESS MONEL NICKEL

THE *Only* ALLOY FOUNDRY WITH *All* THESE FACILITIES

- Laboratory control over raw materials and finished products.
- Dual foundry . . . both hand and machine molding.
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- Centrifugally-cast castings.
- Heat treating of Castings up to six feet.
- X-ray and Gamma-ray inspection.
- Precision Castings.
- Machine shop . . . specially equipped for finishing stainless steel.
- Improved cleaning . . . including Lustracast electrolytic finishing which leaves all surfaces bright.
- Castings furnished rough, polished or fully machined . . . one ounce to two tons.
- Development of special alloys to meet unusual requirements.
- Technical consulting service.

We can all see with the naked eye that the Payroll Savings Plan provides the most stable method of war financing. Analyze it under the X-ray of sound economics and other important advantages are evident.

A continuous check on inflation, the Payroll Savings Plan helps American Industry to build the economic stability upon which future profits depend. Billions of dollars, invested in War Bonds through this greatest of all savings plans, represent a "high level" market for postwar products. Meanwhile, putting over Payroll Savings Plans *together* establishes a friendlier relationship between management and labor.

To working America the Payroll Savings Plan offers many new and desirable opportunities. Through this systematic "investment in victory," homes, education for their children and nest eggs for their old age are today within the reach of millions.

The benefits of the Payroll Savings Plan to both management and labor are national benefits. Instilling the thrift principle in the mind of the working men and women, the Payroll Savings Plan assures their future security—and is a definite contribution to the prosperity of postwar America!

The Treasury Department acknowledges with appreciation the publication of this message by

PAPER TRADE JOURNAL

This is an official U.S. Treasury advertisement prepared under the auspices of Treasury Department and War Advertising Council.

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Pipe and Tube Fittings
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Specialties for Heating Plumbing, Water Works, Fire Protection and Pulp and Paper Mills

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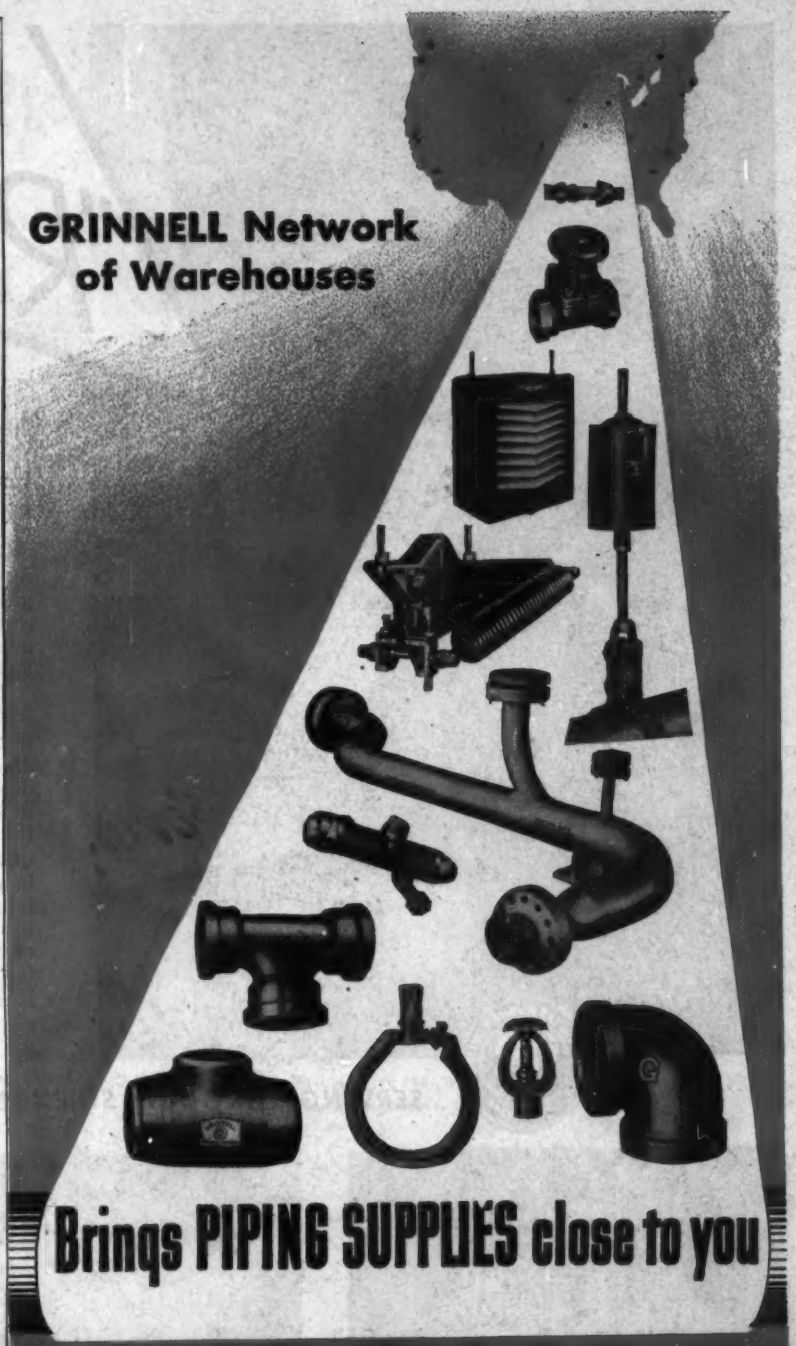
Providence, R. I.
Toronto, Ont.
Warren, Ohio



"RAZOR" OF WATER

SO SHARP IT CAN STRIP A 20-FOOT LOG IN LESS THAN 30 SECONDS

Imagine stripping a log of its bark with jets of water! Yet that is the latest method of de-barking pulp logs.

Two jets of water spurt from nozzles mounted on a mobile carriage. And so great is the pressure (1400 pounds per square inch) that if the to-and-fro movement of the nozzles were slowed down, holes would be bored in the log!

To apply this terrific power, U. S. Rubber Company developed flexible, wire braided high-pressure hose of 1½-inch diameter. This hose, a vital part of the de-barker, was flexed over a million times in tests, to make sure it could withstand the great strain and swift movement required. Under continual high pressure, the hose takes gruelling punishment, yet never fails to maintain the accurate, steady performance required to de-bark logs quickly, cleanly, economically. Hose for de-barking is one of the many examples of U. S. Rubber Company's ability to engineer rubber products for every requirement, for each specific job.

SERVING THROUGH SCIENCE

HIGH-PRESSURE HOSE—(U.S. Style P-7532) carries water to nozzles under 1400 pound pressure. Great flexibility is essential as the sprays move back and forth along the rotating log.

DE-BARKED LOG is shown here ready to be chipped. It is reported that use of the Hydraulic De-Barker using U.S. Wire Braided Hose results in an 18 to 20 per cent saving in pulp and permits the production of chips with one-fifth the manpower formerly used, and one-third the wood loss.

Listen to the Philharmonic-Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren presents an interlude of historical significance.

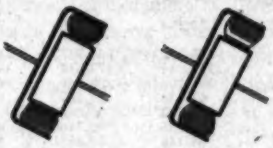
UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK 20, N. Y. • *In Canada:* DOMINION RUBBER CO., LTD.

Proved for You

by an unequaled NAVY RECORD

The Fawick Airflex CLUTCH CONTROLS POWER BY AIR



Here is the way it works
Let air under pressure into the rubber-and-fabric gland, and the clutch engages. Let the air out and it disengages. You can have as light, or as firm, a grip as the job requires.

Under battle conditions, Navy vessels equipped with the Fawick Airflex Clutch have greater maneuverability, and more reliable performance, than naval engineers ever thought possible.

This is proved by the records of thousands of Diesel-powered ships of various types.

Power controlled by air! Power controlled without springs, arms or levers, requires no lubrication, needs no adjustments!

The same clutch has been engineered for industrial use in heavy-duty service—with performance records matching those made on the sea.

The Fawick Airflex Clutch is used with remarkable success on:

Diesel Drives	Rubber Mills
Heavy Presses	Mine Hoists
Drags and Cranes	Oil Field Drives
Paper Mills	Sugar Mills
Steel Mills	Power Shovels

Our Engineering Department will gladly give you complete data, and recommendations based on experience.

FAWICK AIRFLEX COMPANY, INC.
9919 Clinton Rd. • Cleveland 11, Ohio
In Canada, **Renold-Coventry Ltd., Montreal, Toronto, Vancouver**
In Britain, **Crofts Engineers, Ltd., Bradford, England**

Start Public Relations Program

Acting upon the recommendations of the Public Relations Committee of the Salesmen's Association of the Paper Industry, the American Paper and Pulp Association anoounced on January 4, 1945, the start of its public relations program by retaining Col. Frank R. Schell as its public relations consultant.

Although some of the concepts in the report of the Public Relations Committee of the Salesmen's Association of the Paper Industry are not concurred in by the Public Relations Committee of the American Paper and Pulp Association, the two committees are, however, in agreement on many points. This is particularly true of the desirability of securing a public relations expert. The services of this staff consultant, reporting to the secretary of the American

COL. FRANK R. SCHELL

Paper and Pulp Association, "would be available to that association and to the divisional associations. It would be the duty of this consultant to assist the association secretaries in translating their knowledge and information into marketable publicity designed to accomplish a specific purpose, such as public support of the industry's views with respect to tariff legislation." It was recommended that, "the type of influence that is required can best be exerted from the offices of the industry's trade associations, rather than on an expensive public relations propaganda program."

Col. Schell, who has taken up his duties with the American Paper and Pulp Association, has engaged in public relations work for over fifteen years, his most recent work being for the National Industrial Information Committee affiliated with the National Association of Manufacturers. He is a veteran of World War I and at its close was on duty overseas in the Fourth Section of General Pershing's headquarters. Later, he engaged in public relations work with the Thomas A. Edison industries, Pan American Airways, Fox Films and served other clients.

Retaining his interests in military affairs as an officer in the Organized Reserves, he left his public relations bureau, Frank R. Schell Associates, for recruiting and induction duties at the headquarters of the Second Corps Area. Later he served as Executive Officer at Camp Upton and at Governors Island as a member of the Reclassification Board.

Paper Production for November

The following data cover all known mills and represent a continuation of the monthly statistics initiated in "Facts for Industry," series 24-2-1. For annual data and a description of the statistics, "Facts for Industry," series 24-1-2 should be consulted. All inquiries concerning these data should be addressed to the Bureau of Census, Washington 25, D. C.

Type of paper	1944 November	1944 October[1]	November 1943
All types	1,464,698	1,501,175	1,422,433[1]
Newsprint	62,758	61,741	65,833
Groundwood papers	50,805	50,408	50,753
Printing	17,770	19,736	18,221
Specialties	33,035	30,672	32,532
Book papers	120,754	122,123	130,865
General printing	88,850	89,694	95,829[1]
Converting papers	31,851	32,284	34,719
Other book papers	53	145	317
Fine papers	86,083	87,432	84,970
Writing papers	64,212	65,724	62,683[1]
Cover and text	4,956	5,109	4,644
Reproduction	4,610	4,493	4,081[1]
Bristols[4]	7,178	6,835	8,420[1]
Thin papers	4,747	4,828	4,478
Other fine papers	380	443	664
Wrapping papers	164,079	170,976	162,183
Bag papers	31,372	33,579	38,955
Glassine	7,104	6,954	6,916
Greaseproof	1,991	1,845	2,077
Vegetable parchment	2,532	2,438	2,904
Converting papers	61,935	64,486	52,526[1,5]
Wrapping papers	59,145	61,674	58,805[1,5]
Multi-wall sack papers	34,031	33,042	21,472
Special industrial papers	20,196	22,233	17,005[5]
Sanitary papers	68,004	71,960	65,542
Tissue papers	13,357	13,403	13,260
Absorbent papers	7,046	6,970	7,395
Building papers	72,394	74,770	75,010
Paperboard	765,191	786,117	718,144
Container board	359,034	373,047	349,420
Folding boxboard	190,106	189,769	165,437
Set-up boxboard	63,436	64,287	62,081
Cardboard	5,953	5,844	5,977
Building board	92,526	93,318	85,904
Miscellaneous other board	54,136	59,852	49,325
Tube stock	34,689	38,721	29,704

[1] Revised.
[2] Includes a small quantity of paper not classified by type.
[3] Data revised to conform with certain changes in paper and paperboard classifications which became effective beginning January 1944. For figures covering other months of 1943, see "Facts for Industry," Series 24-2-5, Table 2.
[4] Includes Government Postal Card Stock.
[5] Includes a small quantity of Special Industrial Papers having a basis weight of less than 100 pounds. Such paper was classified as Wrapping Paper prior to January 1944.

Prepare To Start Ft. Edward Mill

FORT EDWARD, N. Y., January 8, 1945. Announcement is made that the negotiations for the transfer of the paper mill property from the International Paper Company to the Scott Paper Company have been completed and preparations for placing the plant in operation will be started immediately. Officials of the Scott Paper Company are expected here this week to inspect the mill and property besides completing plans for placing facilities in operation. As a gesture of welcome to the Scott Paper Company and its officials, the local Chamber of Commerce has arranged with merchants to have display windows in each store show the products of the firm. A number of former employees of the International Paper Company already have been hired by the new owners and will assist in preparing the mill for operation. It is reported that the International Paper Company will retain a number of employees here to complete the work of cleaning and transferring the firm's equipment, raw materials, etc., to other of its plants.

COLUMBIA makes another contribution to national industrial progress...

Pacific Coast Production

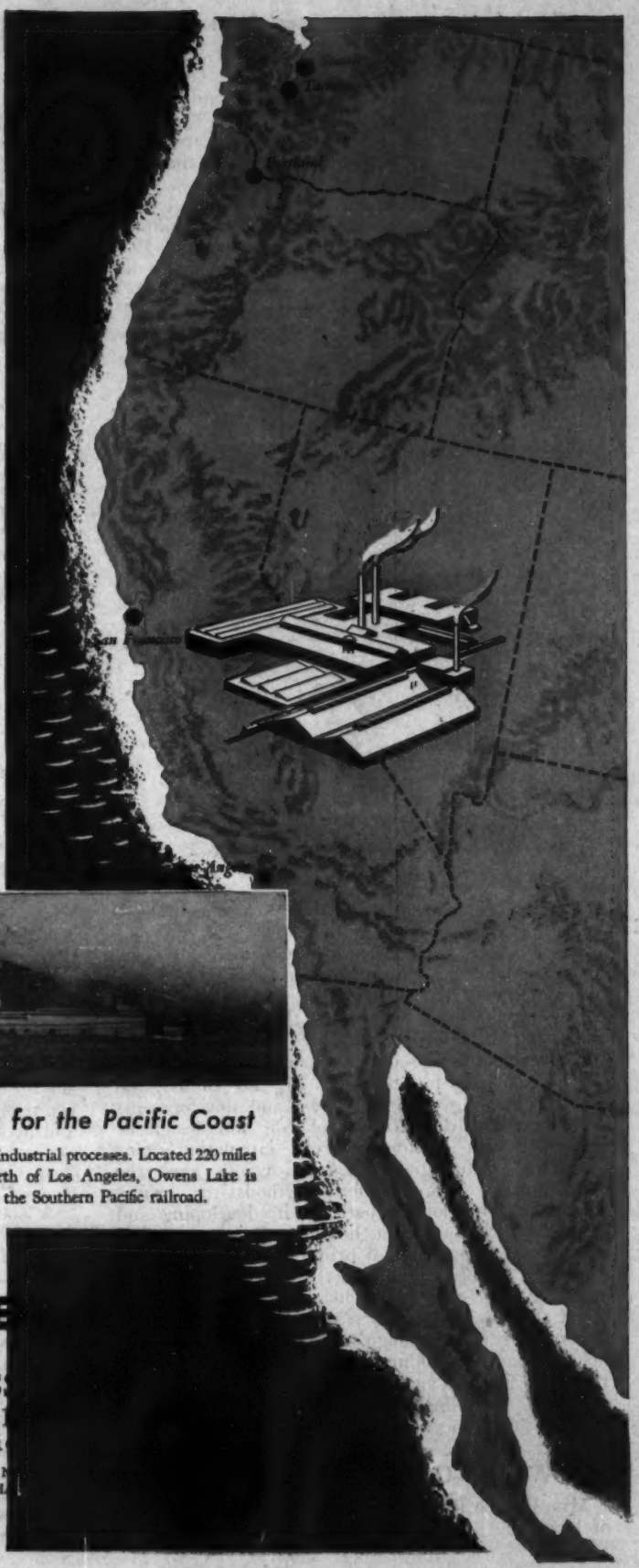
The entire nation looks ahead to the continued expansion of Pacific Coast industry, so necessary to America's future. Columbia is proud to join with the hundreds of industries which will help to add this important chapter to American industrial history.

As announced recently, the Pacific Alkali Company has become a Columbia division. Pacific's rich alkali deposits provide the source of an abundance of essential industrial chemicals. And the production and distribution facilities of Columbia combine to guarantee that these needs of industry, up and down the Pacific Coast, will be efficiently and economically served.

This expansion of Columbia facilities is another example of its progressive policy which seeks not only to serve the immediate needs of its customers throughout the nation, but to anticipate them to as great an extent as possible.

OWENS LAKE, *Rich Source of Alkalies for the Pacific Coast*

Owens Lake is a natural deposit of alkalies consisting principally of Soda Ash, Borax and Sesqui-Carbonates . . . chemicals essential in numerous industrial processes. Located 220 miles to the north of Los Angeles, Owens Lake is served by the Southern Pacific railroad.



COLUMBIA CHE

PITTSBURGH PLATE GLAS
COLUMBIA CHEMICAL
GRANT BUILDING · PITTSBUR

CHICAGO · BOSTON · ST. LOUIS · PITTSBURGH ·
CLEVELAND · PHILADELPHIA · MINNEAPOLIS · CH

Geo. J. Prager Appointed Div. Mgr.

The Norwood Engineering Company, Florence, Mass., announces the appointment of George J. Prager as manager of its paper finishing and converting machinery division.

Mr. Prager is well known throughout the paper industry through his long connection with the trade and his many inventions and developments.

Following early experience in the wallpaper business, Mr. Prager was a full partner in the Printcote Company and in the Dornbusch Agency from 1931 to 1937. Next he took over the management of the Printcote Company, serving as president until 1939, at which time he became associated with A. E. Marconetti, Inc., in a sales and engineering capacity. Since Mr. Marconetti entered the armed services,

GEORGE J. PRAGER

Mr. Prager has been serving the paper field as a consulting engineer.

Mr. Prager is particularly well known for his many inventions and developments in embossing and printing equipment. He designed the first roller bearing embossing machine, as well as the first high-speed embossing machine, and invented a tipping process for covering the tops of embossing.

He has done pioneer work in the aniline and gravure printing machine fields, and developments to his credit include the adaptation and design of automatic web tension controls, circulating color fountains, differential register controls, and the adaptation of more modern methods of drying. Throughout his long experience in developing and installing such equipment, he has made many radical departures in the design of printing machines and has earned an enviable reputation for his ability to design and install fine equipment which produces the desired result at a low investment cost.

Mr. Prager is thoroughly familiar with the whole field of paper finishing and converting, and has a record of success in helping paper men meet their problems, including the many technical problems involved in the new field of laminating.

Woman Gets Suggestion Award

Mrs. Doreen Blanchard has achieved the distinction of being the first woman employee of the pulp and paper plant of the Powell River Company to win an award from the Suggestion sub-committee of the Labor - Management Committee. Mrs. Blanchard received a cheque for $25 for her suggestion to raise the level of the platform at the chipping machine.

An additional award of $100 was also made to W. H. Bertram for his improvement of the spreader bar on No. 7 paper machine. Originally made in February of this year, Mr. Bertram's suggestion brought him $25, but the committee was of the opinion that the value of the idea warranted additional recognition.

Heads Lobdell Co.

Harold L. Springer, Jr., who was recently elected president of the Lobdell Company, Wilmington, Del. to succeed the late Howard Lobdell Seaman, is a native of Wilmington, Del., where he was born some 37 years ago. After graduating from Princeton University in 1929 with degree of B. S. in E., he spent a short time with the duPont Rayon Company in Richmond, Va. as student engineer. Since 1930 he has been with the Lobdell Company—starting in the foundry; then foreman for several years; later in the drawing room for several years; then in 1939 he was made assistant secretary in charge of all purchasing; in 1941 he was made secretary and treasurer of the corporation, and served in that capacity until his recent election as president. Incidentally, the Lobdell Company,, manufacturers of paper mill machinery, forging hammers and car wheels, is now 109 years old.

Lewis-Shepard Issue Catalog

The Lewis-Shepard Company of 300 Walnut street, Watertown, Mass., announces that its new General Catalog, No. 22 is just off the press, and was presented for the first time at the Power Show in Madison Square Garden in New York.

This new publication contains 76 pages and cover with a special file tab and is printed in three colors. All the installation photographs are reproduced in duotone. This printing process gives the third dimension to pictures of the materials handling equipment shown in operation. Another feature is the large size illustrations of the actual equipment. There are special sections on lift trucks, skid platforms, power fork trucks, stackers, cranes, floormaster floor trucks, storage racks and a large selection of specially built equipment for unusual jobs in production, process and in storage.

States Pulp Industry's Policies

A statement of post-war policies for the United States wood pulp industry has been released in booklet form by the United States Pulp Producers Association, Oliver M. Porter, executive director, 122 East 42nd street, New York, 17. It defines conditions necessary for the maintenance of the industry and presents the views of the association, which represents more than 80% of the wood pulp sold by the domestic pulp industry, and over 60% of all wood pulp produced in the United States.

The release includes objectives desired, the position of the United States as the world's leading producer and consumer of wood pulp, relations with domestic consumers and foreign producers, post-war government control of the pulp industry, and discusses timberland management.

SUTHERLAND *continuous beating and refining system*

BEATING AND REFINING SYSTEM

One Sutherland Alone prepares furnish of one paper machine making Bond, Book and Specialties.

SUTHERLAND
REFINER CORPORATION

TRENTON, NEW JERSEY

Calls Wood Shortage Threatening

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., January 10, 1945—The critical shortage in the supply of lumber and pulpwood is threatening the production of essential war materials in this country for at least the first six months of 1945, the War Production Board reported today. Severe decreases in the output of lumber and pulpwood, due to the lack of manpower, and an increasing need for these products to meet essential military demands are the principal factors affecting the supply of these materials.

To alleviate this situation, Tudor Bowen, chairman of the Coordinating Area Production Urgency Committee, WPB, today sent a Field Service Bulletin to WPB regional directors, production urgency committee chairman, and district managers requesting that they give every possible consideration in granting sufficiently high urgency ratings to insure adequate manpower referrals to producers of logs, lumber, and pulpwood.

The bulletin pointed out that:

An increase in the production of lumber and pulpwood throughout the entire nation is essential to the war effort. Lumber is now in such critical short supply that a number of important military programs are seriously affected. Unless action is taken immediately to relieve the manpower and equipment situation, it may be necessary for the military to reschedule some of their essential programs. Over-all lumber production has decreased steadily month by month since August. The supply for the first quarter 1945 is estimated to be 18 per cent below requirements.

Over-all pulpwood inventories in the United States have dropped 12 per cent in the months of September through November of 1944. Much of the available wood pulp supply is now going for non-paper usage such as explosives, rayon and cellophane and the requirements of wood pulp for such materials as military shipping containers and explosives are expanding rapidly.

The Field Service Bulletin points out the serious shortage of all forest products and requests the help of local production urgency committees in referring all possible manpower to the production of lumber and pulpwood.

Workers and Mill Officials Dine

A rather unusual, but very pleasant affair took place recently in Middletown, Ohio. Since March 15, 1943, the Sorg Paper Company has had a union contract with Local No. 112, CIO, Paper Workers' Organizing Committee as the sole bargaining agent for the company employees, and has always enjoyed a very cooperative relationship with them. At their suggestion, all employees were invited to a dinner and entertainment following as guests jointly of the union and the company. This dinner was held on Saturday, December 9, 1944, at the Manchester Hotel, Middletown, Ohio. The expense was divided between the union and the company. There were aproximately 400 of the Sorg Paper Company's 550 employees in attendance.

The dinner was followed by a very short program of speeches by D. G. Driscoll, president of the Sorg Paper Company, Harry Sayre, national secretary-treasurer of the CIO, Thomas Mitchell, field representative of the CIO, Paper Workers' Organizing Committee, and L. C. Currier, mill manager. Each of these speeches emphasized briefly the fine spirit of cooperation that has existed between the union and the company and pledged support to a continuation of this cooperation for progress. Also at the speakers' table were other union officials and the officers of Local No. 112.

The program of speeches was followed by entertainment, including dancing, singing and ventriloquism furnished by outside talent and employees of the company.

It was very generally felt and expressed by company officials, supervisors and employees that this gathering had been very beneficial from a morale standpoint and helpful in creating a friendly relationship between employees, departments and management.

Abitibi Pays on Bonds

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., January 8, 1945—The December 30, 1944, payment on principal and overdue interest to holders of Abitibi Power and Paper Company, Ltd., bonds, was on the basis of $166.50 for each $1,000 in bonds held, of which $102.32 was interest and $64.18 on principal.

Whether the interest amount in the payment on the Abitibi 5% bonds would be considered as 1944 or 1945 taxable income has been a matter of considerable speculation, but it is understood now that Dominion income tax officials have ruled that as the cheques were mailed to bondholders in 1944, the interest portion of the cheques will be considered as 1944 income, no matter when the cheques are cashed.

In the meantime, Abitibi 7% preferred stock sold at its all-time high price of $146¾ per share last week upon reports that unanimity had been reached by representatives of all classes of securities of Abitibi toward a suggested amendment to the Hughes Committee Report. As reported earlier, the amendment provides for the 7% preferred shareholders receiving five new $20 par value preferred shares cumulative from January 1, 1945, instead of four $20 par value shares which were to be cumulative from January 1, 1947. The dividend rate of $2.50 per share and callable price of $37.50 per share remain unchanged. A supplementary report is understood to be in preparation and when completed will be forwarded to Premier George Drew of Ontario by the Hughes Committee, which he set up to find a solution to the long-drawn-out difficulties of this great pulp and paper company.

Considerable market interest has developed in the 7% preferred shares and some sources predict that the stock will go even higher.

Bill Amends Waterleaf Paper Duty

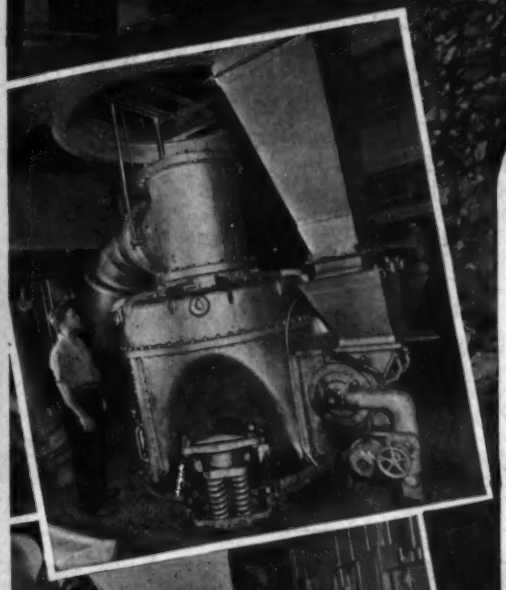
[FROM OUR REGULAR CORRESPONDENT]

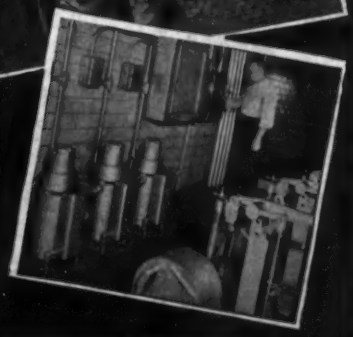
WASHINGTON, D.C., January 10, 1945—Representative Shafer of Michigan has introduced a bill (H.R. 331) to amend the tariff act of 1930 with respect to the duty on waterleaf paper. The bill, which has been referred to the House Committee on Ways and Means is as follows:

That paragraph 1409 of schedule 14 of the Tariff Act of 1930 is amended by inserting after "blotting paper, 30 per centum ad valorem;" the following: "uncoated paper commonly or commercially known as waterleaf paper, suitable for use for the manufacture of vegetable parchment paper, 10 per centum ad valorem;".

"MOTOR-DRIVE IS MORE THAN POWER"

RELIANCE V★S DRIVE





Each of the 14-ton-per-hour mills (upper photo) serves one 500,000 pound-per-hour boiler. Amount of coal fed into each mill, and thence to its boiler, is regulated by a Reliance V★S Drive unit, three of which are shown in above illustrations.

INVESTIGATE THE POSSIBILITIES of this *All-Electric* V★S DRIVE

OPERATING FROM A-c. CIRCUITS!

CONSTANT MAINTENANCE of a desired steam pressure from boilers is important in power company operation. To you, who may not need to worry about this problem, the fact that it is being handled automatically with the help of Reliance V★S Drive should nevertheless be interesting. It is a good indication of the wide variety of uses to which V★S Drive may be put.

"Reliance V★S" is an all-electric, adjustable-speed drive for A-c. circuits that provides for starting, stopping, speed-changing, smooth acceleration and deceleration, jogging, inching and other operations. All are centrally controlled from a conveniently located panel. Production machinery output is being increased, quality and uniformity of products improved, operator fatigue decreased and operation and maintenance costs lowered by many V★S Drive applications in many industries.

If you haven't investigated Reliance V★S Drive in relation to your own work, we suggest that you call in a Reliance Application Engineer.

RELIANCE ELECTRIC & ENGINEERING CO.

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Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville (S. C.) • Houston Kalamazoo • Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh • Portland (Ore.) St. Louis • San Francisco • Syracuse • Washington, D. C. • and other principal cities

RELIANCE A-C D-C MOTORS

Delaware Valley Section Meets

The Delaware Valley Section of the Technical Association of the Pulp and Paper Industry met Friday night, January 5, to hear James A. Lee, editor of *Chemical and Metallurgical Engineering* discuss new materials for mill construction and maintenance.

Many of the materials mentioned by Mr. Lee are in the developmental stage and others have been used only in the essential industries, consequently the pulp and paper industry has not had the opportunity up to the present time, to consider them. Ten years or so ago the development of the metals was most important but of late nonmetalic materials are of interest to mill men. Among these can be mentioned the development of acid, alkali, and water resistant resins, paint, glass, and synthetic rubbers which are important in the construction and maintenance of tank linings and piping. Most of these materials have increased resistance to thermal shock as well as to chemical action. A new product 'Chemstone' may find wide application in the construction of tanks, vats, headboxes, and the like while impervious carbon may be used for digester linings and in the handling of black liquor. The laminates of glass, paper, and wood will become increasingly important. Packings have been greatly improved in respect to their resistance to chemicals and the use of 'Silicones' will alleviate much of the difficulties caused by the action of chemicals on valves. The light weight metals and alloys will have a wide application. It was readily apparent to all those who heard Mr. Lee that the mill engineer will find a solution to many of his maintenance problems in the materials that have been introduced to industry in the last few years. However, it is to be recognized that no list can be complete at this time because of the war and that with the continuance of development work many other new construction materials will become available.

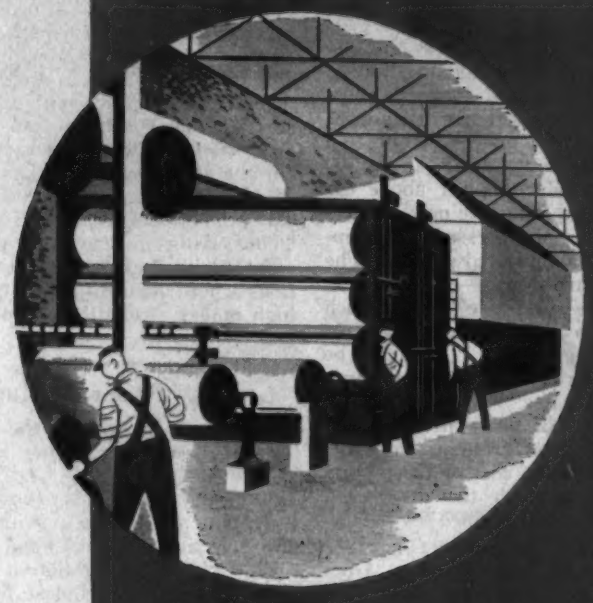
Those who were present Friday night were: E. J. Albert, A. E. Bartlett, N. E. Bartlett, E. R. Baulitz, Dorothy A. Beiswinger, R. T. Bingham, A. L. M. Bixler, A. R. Boyd, S. G. Briscoe, W. J. Burke, L. K. Burnett, W. F. Connolly, C. M. Connor, Thage Dahlgren, Edward DeLauter, Walter Dempsey, J. C. Dieffenderfer, G. H. Ditwiler, W. P. Dohne, J. E. Doyle, Paul Easton, Fred Elliott, H. J. Farra, Jeanne Fisher, E. A. Georgi, E. N. Glauner, J. F. Good, R. E. Green, Lois V. Hans, J. C. Harper, Jr., J. Jacobsen, W. H. Langhrey, W. H. Lapp, J. A. Lee, Lieut. R. H. Lippincott, G. B. Martin, R. P. McGinley, Louise E. McGrath, Alex McInnes, L. B. Miller, E. C. Molin, I. Newman, L. Newman, D. C. Nicholson, . A. Paciello, R. W. Porter, J. E. Plumstead, H. F. Ray, E. H. Rice, C. J. Ryder, Jay Smith, H. H. Street, G. M. Suydam, T. N. Temple, T. W. Toovey, H. F. Volk, A. E. Waugh, K. R. Watt, R. Wiggins, W. R. Willets and E. A. Yerger.

Italian Paper Mills Resume

Italian paper manufacturers are beginning to resume production, says a trade report received at the Department of Commerce. Plants in Rome and Tivoli are already said to be turning out about 200 tons of newsprint a month while four large paper mills in the Liri valley and a pulp mill at Foggia are expected to begin operations shortly.

ONE OF 27 DOW CHEMICALS USED BY THE PAPER INDUSTRY

how the paper industry wrapped up a moldy problem

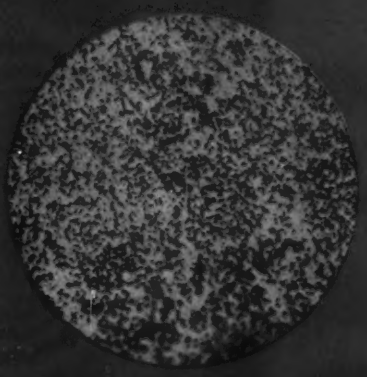


Moisture means mold. Mold makes costly inroads on profit. That's why the experience of the wrapping paper industry with Dowicide is interesting and important to many others confronted with mold problems.

Wrapping of soap has long been a major problem. Paper used for this purpose is subject to mold attack because of the high moisture content of soap. Moldy packages caused housewives to reject the product. To lick the problem, Dow technicians were called. They investigated . . . experimented . . . went into a huddle . . . came out with Dowicide.

The years have proved the success of Dowicide. Today, many high-moisture products are wrapped in Dowicide treated paper.

In fact, Dowicide has licked many other mold problems in the paper industry, as well as in other fields such as paint, textile, lumber, and many more. If you have a mold problem, write us to find out how Dowicide can help you.



Dowicide

Germicides and Fungicides

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit
Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY

A New Plastic

A new Westinghouse plastic, known as Micarta 444, combines the desirable molding properties of thermoplastic materials and the good physical characteristics of thermosetting materials. A modification of the resin in standard Micarta causes the substance to soften when hot, as do thermoplastic materials, but at a much higher temperature, about 300 degrees F., which is far above the service range. Thus the new Micarta can be heated and pressed into deep-drawn and complicated shapes. The pressures are lower—about 50 to 100 pounds—and the times much shorter than required for curing of thermosetting resins. Dies can be made of hard wood or of thermosetting laminates. This makes the manufacture of a relatively small number of parts from a single die economical as the cost of these parts is not loaded with the distributed cost of an expensive die.

When cool the product has the good strength and freedom from embrittlement characteristics of many thermosetting materials. Used in aircraft for nonstructural and semi-structural members, a weight saving of some 50 per cent over a comparable volume of metal has been achieved. In addition, a considerable saving in man hours of labor has been made. In one particular operation, a single sheet of formed Micarta replaced an airplane part formed of four separate pieces of aluminum. The aluminum sections were welded together. Forty inches of weld were saved which contributed to the one and one-fourth man hours required for the aluminum part. The formed Micarta part requires 19 minutes to produce and weighs but half as much. These savings indicate the possibilities afforded by the material in applications where good insulating qualities, high impact strength, and good thermal stability are required.

How Paper Is Made

Just off the press, the booklet "From Trees to Printing Presses," published by Kimberly-Clark Corporation, Neenah, Wis., covers the operation of paper making—from the selection of the wood in the forest and its preparation at the mill for readying into cellulose fibers, on down to the finished product—paper.

The booklet carries actual mill operation illustrations and accompanying explanatory text matter covering the different steps taken in a paper mill—such as removing bark, screening the chips, digesting, cooking, beating, refining the pulp and making the paper.

One chapter is devoted to the exacting tests all raw materials as well as the finished sheet of paper must undergo before the product meets the quality-control standard set for it.

There is a double spread illustrating several types of printing presses used today, with diagrammatic sketches showing the paper travel through the presses — delineations not often found in a booklet of this nature.

In the back are three glossary pages explaining various terms used in the process of making paper.

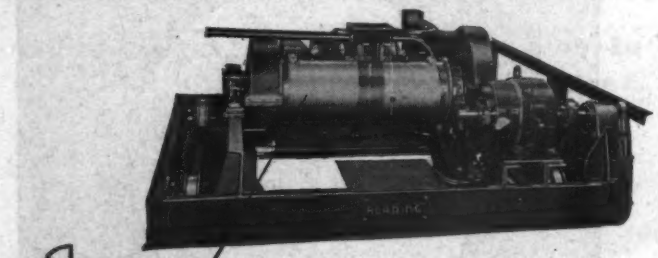
All those connected with Graphic Arts activities—as well as students of printing—should find considerable worthwhile information in "From Trees to Printing Presses." Copies may be had from the Advertising and Merchandising Department, Kimberly-Clark Corporation, 8 South Michigan avenue, Chicago 3.

Farrel-Birmingham

Farrel-Birmingham Company, Inc. has announced the adoption of a retirement pension plan for the employees of its three plants at Ansonia and Derby, Conn., and Buffalo, New York. The plan has met with ready acceptance by employees, 97 per cent of the 968 initially eligible having signed up for membership.

The plan, which is effective from January 1, 1944, is designed to provide retirement income to supplement the old age benefits of the Federal Social Security Act. The company is undertaking to finance all of the pension benefits for past service as called for in the plan, as well as the entire cost for the year 1944. With respect to future service, the plan is a cooperative effort, and the retirement fund will be built up from the combined contributions of employees and the company. Permanent employees, absent on duty with the armed forces during the present war, receive credit for eligibility.

A pension committee has been appointed by the board of directors of the company to administer the provisions of the plan. The Central Hanover Bank and Trust Company of New York City is trustee and will hold the contributions made by the employees and the company in a trust fund, which may be invested only in securities which are legal investments for life insurance companies under the laws of the State of New York.



SAVE ON MAINTENANCE WITH READING CRANES

You save on maintenance costs with Reading Cranes because of the simple, easily accessible unit design. This permits easy removal from the hoist assembly of individual motors, drums or gear housings without disturbing other units or changing their alignment.

Other low maintenance features are: split gear cases to simplify maintenance, long life anti-friction bearings throughout, machined grooves on the drum to save cable wear and replacement. For full information on the long trouble-free performance of Reading Cranes, write for your copy of "The Why and How of Faster Production at Less Cost."

READING CHAIN HOISTS-ELECTRIC HOISTS OVERHEAD TRAVELING CRANES

READING CHAIN & BLOCK CORP. 2108 ADAMS ST., READING, PA.

...will be VITAL in meeting post-war competition...

Beckman pH Control Reduces Waste!

By insuring more uniform quality of product with less plant maintenance, waste and "rejects" are reduced and equipment life is prolonged... a *double saving in production costs!*

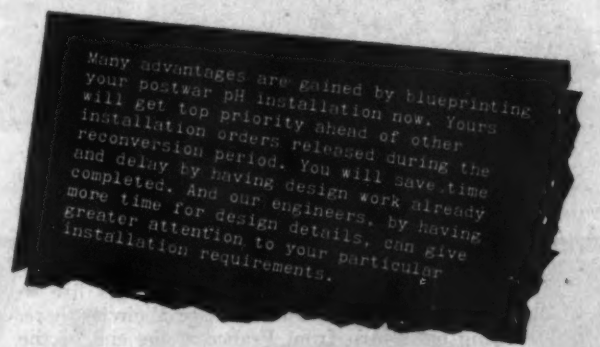
The Beckman Automatic pH Indicator—the most advanced instrument available today for fully automatic pH indication, recording, control. Send for Bulletin 161

Here's what you can do NOW to speed your Beckman pH installation!

BECKMAN pH CONTROL has proved so important in saving time and in increasing the efficiency of war-time production operations that today practically all of our instruments are going to high priority war jobs.

But the same outstanding savings that Beckman equipment is making possible in war operations will prove equally vital in meeting the stiff competition of civilian postwar production. Regardless of your present priority situation you can start your Beckman pH installation *now*. Here's how... Practically every Beckman large-scale process control application is individually engineered to the requirements of the particular job. This requires time and considerable detailed technical work by trained engineers.

By letting us start *now* to study your pH requirements and to work out the particular type of installation best suited to your production problems, your Beckman pH installation can be completely designed and blueprinted *ready for immediate installation when war demands permit.*


Many advantages are gained by blueprinting your postwar pH installation now. Yours will get top priority ahead of other installation orders released during the reconversion period. You will save time and delay by having design work already completed. And our engineers, by having more time for design details, can give greater attention to your particular installation requirements.

Send us your pH problems now. Our engineering staff will be glad to consult with you on the best solution to your problems.

BECKMAN INSTRUMENTS NATIONAL TECHNICAL LABORATORIES
South Pasadena • California

BECKMAN INSTRUMENTS CONTROL MODERN INDUSTRIES

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for Week Ending January 6, 1945

STOCKS

	High	Low	Last
A. P. W.	4⅞	4⅛	4⅜
Armstrong Cork Co.	45½	44¾	45⅜
Celotex Corp.	15¾	14⅝	15¼
Celotex Corp., pf.	19⅛	18½	18⅝
Certain-Teed Products Corp.	7⅛	7	7⅛
Certain-Teed Products Corp., pf.	129¾	129¼	129⅜
Champion Paper & Fibre Co.	29½	28½	29½
Champion Paper & Fibre Co., pf.	114	114	114
Congoleum Nairn Co.	29¼	29	29
Container Corp. of America	29⅞	29¼	29¼
Continental-Diamond Fibre Co.	12⅜	11	11⅜
Crown-Zellerbach Co.	21⅞	21¼	21⅜
Crown-Zellerbach Co., pf.	103¾	103	103¾
Dixie Cup Co.	19¾	18	19¼
Dixie Cup Co.,—A	48	47¼	47¼
Flintkote Co.	24½	24	24
Flintkote Co., pf.	..	..	..
Robert Gair	4⅜	4½	4⅜
Robert Gair, pf.	16⅜	16	16
International Paper Co.	22¾	20⅜	21⅝
International Paper Co., pf.	91⅞	90	90½
Johns-Manville Corp.	103½	101	102
Johns-Manville Corp., pf.	..	..	..
Kimberly-Clark Corp.	39½	38⅛	39⅛
Mac Andrews & Forbes	29¾	28¾	29⅞
Mac Andrews & Forbes, pf.	..	..	..
Masonite Corp.	41⅞	40¾	41⅛
Mead Corp.	13	12¾	12¾
Mead Corp., pf. A—6%	..	..	..
Mead Corp., pf. B—5½%	94½	94	94
National Container Corp.	14¾	14⅛	14⅛
Paraffine Companies, Inc.	59	57½	59
Paraffine Companies, Inc., pf.	..	..	..
Rayonier, Inc.	17¾	16⅞	16⅞
Rayonier, Inc., pf.	34¾	34¾	34¾
Ruberoid Co.	34¾	33⅝	34¼
Scott Paper Co.	44	42¾	44
Scott Paper Co., pf.	..	..	..
Sutherland Paper Co.	35	34	35
Union Bag & Paper Corp.	15¾	14½	14⅝
United Paperboard Co.	6¾	6⅝	6⅞
U. S. Gypsum Co.	81	79¾	80
U. S. Gypsum Co., pf.	..	..	..
West Virginia Pulp & Paper Co.	25¼	24½	24½
West Virginia Pulp & Paper Co., pf.	109½	109½	109½

BONDS

Abitibi Pulp & Paper Co. 5s '53	98¼	96¼	96¾
Celotex Corp. 3½s '55	..	..	..
Certain-Teed Products Corp. 5½s '48	102	101¾	102
Champion Paper & Fibre Co. 4¾s '50	..	..	..
International Paper Co. 6s '55	108¼	107¼	107⅞
International Paper Co. 5s '47	104½	104¼	104½
Mead Corp. 3½s '53	..	..	..
West Virginia Pulp & Paper Co. 3s '54	..	..	..

New York Curb Exchange

High, Low and Last for Week Ending January 6, 1945

STOCKS

	High	Low	Last
Great Northern Paper Co.	..	..	..
Hummel-Ross Fibre Corp.	8¼	7½	8¼
St. Regis Paper Co.	6¾	6⅝	6¾
St. Regis Paper Co., pf.	..	..	..
Taggert Corp.	..	..	..

BONDS

American Writing Paper Co. 6s '61	101½	101½	101½

To Manage Tulsa Office

The Foxboro Company, of Foxboro, Mass., makers of industrial instruments for measurement and control, announces that Wendell A. Melton has been appointed District Manager, in charge of the Tulsa territory, and has already taken up his duties at the company's office, in the McBirney Bldg., Tulsa 3, Okla.

Mr. Melton, who has spent most of his life in Oklahoma, is widely known in industrial circles there. Following his return from France at the end of the first World War, he became a construction and operating engineer serving oil and gas companies, and later was a consulting engineer, specializing in oil and gas work. In 1936 he was appointed Business Manager for the Board of Education of Tulsa and since then has held this position, which he recently resigned to join the Foxboro organization. Among his civic and fraternal connections, Mr. Melton is the President of the Engineers Club of Tulsa.

OPA Freezes Book Paper Prices

Manufacturers' ceiling prices for all book papers sold to wholesale merchants or to the Federal Government have been frozen at their highest lawful prices in effect during the final quarter of 1944, the Office of Price Administration announced on January 5.

This general freeze becomes effective January 5, 1945, simultaneously with elimination of the method heretofore followed in establishing ceilings for these sales.

Book papers sold by manufacturers to buyers other than wholesale merchants and the Federal Government are not affected by today's change.

While current prices for book papers are not changed by this action, OPA has eliminated the old method of determining ceilings on sales to merchants and the Federal Government on the basis of listed grades and brand names because the Emergency Court of Appeals ruled on December 6, 1944, that it was discriminatory. The term "grade" has also been redefined in terms of each manufacturer's classification of his own papers instead of in terms of trade classification and recognition.

As the court's ruling concerned the method and not the resulting ceilings, OPA is eliminating the old method while retaining the existing ceilings through a freeze of current prices.

OPA said that it was anxious to comply in every sense with the court's ruling and that the agency would further consult with the industry to determine whether today's changes represent the most satisfactory way of complying with the court's decision.

In any event, OPA said, the agency intends to issue in the near future a revision of the book paper regulation that will do away with the use of the old regulation containing the provisions now revoked. This step will be taken to give fullest justice to the objections that have been raised.

On new and different grades of paper, not sold or offered during the freeze period, manufacturers may establish ceiling prices in line with the ceiling for the grade sold then that is most closely comparable on a cost basis. However, where this results in a price outside the range of prices charged by other manufacturers for similar book paper, the price of the most closely competitive seller shall be used. Ceilings established under either of these two provisions must be reported to OPA for approval.

Robert B. Griffin Made Vice President

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., January 8, 1945—Robert B. Griffin, vice president and director of United Wallpaper, Inc., was elevated to the position of senior vice president, and Robert L. Boyd was elected vice president in charge of operations, it was announced today by William H. Yates, president. Boyd was formerly general manager of operations.

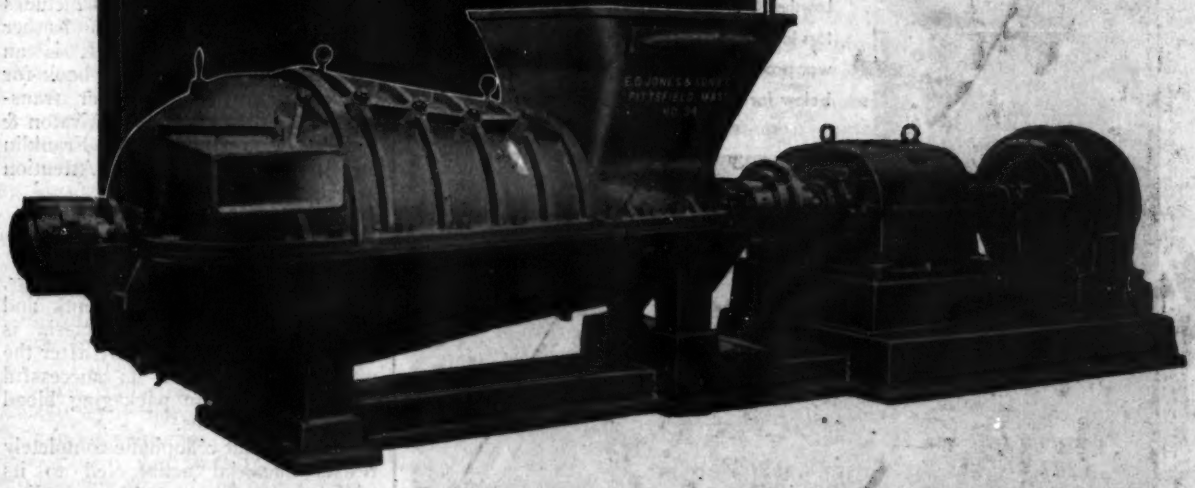
Active in the wallpaper industry since 1896, Mr. Griffin was formerly president of Robert Griffin Company, one of the companies now merged with United Wallpaper, Inc. He has been a member of the board of directors of United since 1927. His home is in New York.

Boyd joined the company in 1929 as a color mixer in the Chicago factory. From 1934 to 1938 he was with Kimberley-Clark corporation, Appleton, Wis., and then returned to United as an inspector. In 1942, he was made general manager of operations.

THE JONES PULPER

For Quick, Complete, and Efficient Defiberizing at LOW COST

Completely defiberizes, with equal facility, hard sized rag or half rag papers; sheeted or lapped Sulphate, Sulphite, Soda or Mechanical Pulps, and can be regulated to obtain the desired results.



Jones

GEARED FOR WAR PRODUCTION

E.D. JONES & SONS COMPANY-PITTSFIELD, MASS.

Builders of Quality Machinery for Paper Mills

Paper In Poor Supply

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., January 8, 1945—Little change was seen last week on the overall paper situation. Most items continued tight. Manufacturers and jobbers say the situation is far from ideal and with the likelihood of continued war in Europe for some time to come, they are not expecting any improvement in supplies or labor.

Demand for containers continued heavy last week. Paper board was rather scarce, but all the local factories were producing to the limit of their capacity, when materials and labor are considered. They could produce more under more favorable circumstances. Lack of containers is causing a particular hardship to the producers of eggs, butter and other dairy products. No paper milk containers have been seen for some time, manufacturers being forced back to the former glass bottle. Breweries and distilleries also are being hit by the container shortage. A number of state breweries have been compelled to return to the wooden case after having found the reinforced boxboard container eminently satisfactory.

Demand for roofing and building paper continued fair last week, but severe weather has begun to hamper outdoor construction. Temperatures hovering around the zero mark will cause a lightening of the demand soon, it is predicted.

With the holiday season over, it was expected that demand for bags and wrapping paper would lessen, but thus far such has not been the case. Retail business here continued very heavy last week and in some instances there was an acute scarcity of bags. No change was seen in the rag or waste paper market.

1-MAN CREW FELLS 11" PINE IN 7 SECONDS

—and that's a typical enthusiastic report on the Lowther C-Saw! Large timber operators say—"It enables one man to do the work of 3". Single independent loggers say—"It triples my former production". Whether the job is felling or clearing—whether hardwood or pulp—the Lowther C-Saw is producing for timber operators in these days of scarce labor and pressing war production. Find out about it. Mail coupon below for descriptive circular.

HARRY A. LOWTHER COMPANY, 141 W. JACKSON BLVD., CHICAGO 4, ILLINOIS
Send me circular 66 that shows me how to triple my output.
Name_____
Address_____

Leather Belting

The Leather Belting Selection and Application Manual provides a simple, non-technical approach to a subject that frequently is permitted to become involved. This 56-page manual offers data, charts, and specifications to support the following headings—how to pick the right leather belt for the job, including information on tannages, the figuring of belt dimensions, etc.; how to decide between modern group drive and automatic tension (pivoted motor base) drive; how to compare the efficiency and cost of multiple V-Belt drives and flat leather automatic tension drives; how to figure flat leather automatic tension drives; how to figure flat leather belt prices; how to install flat leather belts properly; how to make belts deliver more power and last longer. The manual includes a brief catalog section of leather belting and accessories. It is an exceptionally fine reference book for anyone interested in power transmission. For a copy write Graton & Knight Company, 356 Franklin street, Worcester 4, Mass., Attention Merchandising Department.

Bacteria Barrier

Use of cellophane to protect drugs, bandages, medical instruments and foods from dangerous bacteria is expected to increase rapidly after the war as a result of its successful application now in packaging blood transfusion needles.

The fact that cellophane completely resists bacterial action led to its adoption for this purpose, according to Sylvania Industrial Corporation, large cellophane manufacturers, with the result that even in the midst of battle, blood transfusions can be administered with completely sterile needles.

In the packaging operation the needles are slipped into glass vials, and cellophane is sealed around the glass. In addition to the barrier it offers to questing bacteria, cellophane sterilizes well, protects the glass from breaking and gives complete visibility, so that the contents of the package may be determined at a glance.

New Dodge-Timken Bearing

The Dodge Manufacturing Corporation of Mishawaka, Ind. announces a new Dodge-Timken Bearing known as Type "E" which is now available in both pillow blocks and flanged units. This bearing was engineered to provide all features necessary for satisfactory performance under normal service conditions at a low price which has been made possible by use of modern machinery and tooling.

It is designed to give 30,000 hours or more of service under conditions for which it is adapted as determined by use of standard selection tables applying to the complete Dodge-Timken line.

The method of fastening to shaft is simple and effective. On each end of the extended inner race is a steel collar having two headless set screws spaced 120° apart and extending through clearance holes in the inner race to the shaft. These four set screws provide a positive lock to prevent rotation of the inner race on the shaft.

Housings are compact and rugged and are precision machined to close tolerances on automatic machines.

Simple, effective labyrinth seals prevent loss of lubricant and protect bearings against damage from dust, dirt or moisture. These seals are equally effective whether the bearing is on or off the shaft. The bearings are completely assembled, lubricated and adjusted at the factory. While not fully self-aligning these bearings have enough self-alignment inherent in the design and arrangement of the Timken rollers to compensate for any normal misalignment.

Meet at Glens Falls

[FROM OUR REGULAR CORRESPONDENT]

GLENS FALLS, January 8, 1945—Representatives of leading paper manuafcturing concerns in this section held a meeting here last week at which problems concerning the industry were thoroughly discussed. The guest speaker was Congressman Dean Taylor, who was brought on an inspection tour of the paper mills of Finch, Pruyn & Co. He stated that he realized the importance of the industry and expressed the belief that the time is fast approaching when the industry should turn to Congress to promote and protect its interests. It is estimated that at least 10,000 persons are employed in manufacturing pulp and paper products. Congressman Taylor expressed his appreciation for the opportunity of meeting with the manufacturers and discussing their problems besides praising the splendid labor relations.

IT'S A CINCINNATI BELT

Transmission and Conveyor Belts carrying the name Cincinnati have been cited for achievement wherever used for important work in the paper industry. Whether transmitting power or conveying materials they have added a shining, new chapter to Cincinnati performance.

To Paper Mills looking to the future, we say, keep your eye on *Cincinnati* . . . for high efficiency . . . for low ultimate cost . . . for long service.

THE CINCINNATI RUBBER MFG. CO.
CINCINNATI, OHIO

CINCINNATI
CONVEYOR AND TRANSMISSION BELTS · HOSE

Tornado in a Box

The gas turbine, newest source of prime power, makes its motion picture debut in a film released by Allis-Chalmers Manufacturing Company entitled "Tornado in a Box."

Taking a cue from the extremely wide popularity of the gas turbine, the movie unfolds the story of the gas turbine in a manner which will make its principle readily understandable to the largest possible audience which could be interested in the potentialities of a new prime mover. At the same time, the film frankly indicates that a great deal more of the tremendous engineering effort already applied must still be put into gas turbine development.

The film, which contains no advertising, is being loaned free to any industrial or engineering group interested. It is a 16 mm film, for sound.

To borrow or purchase "Tornado in a Box" write the Allis-Chalmers Manufacturing Company, Milwaukee, 1, Wis.

PAPER
TRADE JOURNAL
Title Reg. U. S. Pat. Off.
Henry J. Berger, Editor

COMING EVENTS IN PAPER INDUSTRY

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, Convention, Commodore Hotel, New York, February 19-22, 1945.

NEW ENGLAND SECTION. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

DELAWARE VALLEY SECTION. Technical Association of the Pulp and Paper Industry—First Friday of each month at the Engineers Club, Philadelphia, Pa.

LAKE STATES SECTION. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

KALAMAZOO VALLEY SECTION. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

EMPIRE STATE SECTION. Technical Association of the Pulp and Paper Industry—Second Thursday of each month at the Woodruff Hotel, Watertown, N. Y.

CHICAGO PROFESSIONAL PAPER GROUP—Third Monday of each month except July and August at Chicago Bar Association, Chicago, Ill.

WOOD PULP

The supply of raw materials, other than chemicals, for the production of paper and paper board continues inadequate to fulfill all requirements. Although total mill receipts of pulpwood are relatively good, more pulpwood is required. The production of wood pulp is below government demands. More waste paper must clearly be salvaged to meet the demands of mills to maintain the heavy paper and paper board output desired. Rag supplies are adequate in some grades to meet current requirements but the higher grades are becoming scarce. The increase in the all-over government demands to take care of the war requirements must be met and upon how fully this can be done depends the tonnage of paper and paper board available for civilian use.

In wood pulp the supply situation is slowly becoming more critical for the production of paper and paper board for the home front. In its latest industry report the Department of Commerce points out that the "bottom of the barrel" had been reached in October. Wood pulp inventories at that date reached the lowest point in the war period. The decrease was 30% under October, 1943, and 62% below October, 1942. "Inventories have been gradually declining since the middle of 1944, when the peak of a modest upswing had been reached, and though production reached its highest point since May, 1942, consumption likewise followed closely and slightly in excess of new supply, allowing for no inventory increase because of the pressing need for wood pulp. As was the case in September, consumption plus exports have exceeded new supply in October, and though the difference was less than 1% in October, it still constituted a drain on inventories. For the ten months of 1944, the difference between consumption plus exports and new supply was less than 1%, while in the corresponding 1943 period the difference was about 5%. Imports were 17% less up to November, than in 1943, while exports declined about 26%. However, since imports are about five times larger than exports, the result is a smaller net supply for domestic use."

Wood pulp production for the ten months of 1944 totaled 8,400,000 tons, compared with 7,970,000 tons for the like period in 1943, an increase of 5.4%. Increases in 1944 above 1943 for various types of pulp were as follows: miscellaneous, 27.8%; bleached sulphate, 10.0%; unbleached sulphate, 8.5%; and high alpha and dissolving grades, 9.9%. Decreases were: grades other than high alpha and dissolving, 8.4%; bleached sulphite, 3.7%; semi-bleached sulphate, 3.4%; unbleached sulphite, 1.6%; soda, 1.9%, and groundwood, 0.1%.

In reference to the price structure for special grades of imported wood pulp, the Department states: "In order to facilitate the pricing of special grades of foreign wood pulp newly imported into the United States when imports from Europe are resumed, the OPA established in November a procedure to be followed by the importers (Amendment No. 2 to RMPR No. 114, effective November 27, 1944). This action does not cover standard grades of wood pulp, as dollar and cent ceilings are already established for such grades, whether produced in the United States or imported. Maximum prices for new imports of special grades of wood pulp may be established by the OPA on written application at the ceilings already established for the same or most comparable grades of wood pulp produced in the United States, without the foreign producer being required to submit cost or financial data. The application for a proposed maximum price need include only a statement of the special characteristics of the grade."

The interpretation further states that: "However, if maximum prices requested for sales of newly imported special wood pulp grades in the United States are above domestic ceilings here for the same or most comparable grade, data must be furnished by the producer on the proposed sales prices and terms of sales, with an itemized statement of the costs of production, and a statement of the special characteristics of the grade. This action also authorizes the OPA, upon written application, to adjust maximum prices for special grades of foreign wood pulp now sold in the United States to the ceiling already established for domestic producers without the foreign producer being required to submit cost or financial data. It it is not prepared to take action at once on a written application for a new ceiling, the OPA may by letter authorize sales at the seller's proposed price, any other price, or on an open billing basis, subject to such terms and length of time as specified, pending a final establishment of the ceiling price. Any increases that might result in the costs of imported wood pulp from an adjustment or new ceiling action by OPA would be absorbed by purchasers of the wood pulp."

In announcing wood pulp shipments from Canada the Department states: "In line with the program announced by the WPB in November, after discussions between United States and Canadian officials, Canada pulp exports to the United States for the first half of 1945, will be at the annual rate of 1,000,000 tons, or about 83,000 tons monthly. This is a substantial decrease from the 1,100,000 ton annual rate for 1944, when shipments were scheduled at about 91,600 tons monthly. Shortages of wood in Canada and the need for supplying additional quantities of wood pulp to Great Britain and other Allied countries necessitated this action.

The department's charted trends in unbleached sulphite pulp, up to the middle of October were upward in new supply, consumption plus exports, with inventories continuing downward. Domestic consumption, production and import trends were upward, with exports leveling out. The new supply of unbleached sulphate pulp, as charted, indicated both were approximate and upward, while inventories were levelling out. Production and domestic consumption are approximately the same and upward, with exports downward and imports levelling out.

William F. Bromley Retires

William F. Bromley, secretary of the Hammermill Paper Company, Erie, Pa., retired from the company on January 1, after thiry years of service.

Mr. Bromley joined the Hammermill Paper Company in 1914 as assistant sales manager and also filled the positions of assistant secretary, vice-president and director. He resigned as a member of the executive committee and board of directors last year.

Production Ratio Report*

(Production as per cent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

Current Weeks—1944		Corresponding Weeks—1943	
November 25	88.2	November 27	87.6
December 2	92.2	December 4	92.2
December 9	93.6	December 11	88.9
December 16	89.2	December 18	89.9
December 23 (Revised)	85.5	December 25	68.6
December 30	*61.0*	January 1, 1944	70.3

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Avg.
1943	87.2	88.9	89.5	88.7	91.4	84.8	84.3	91.0	88.3	89.6	89.6	82.0	87.8
1944	88.7	88.5	88.1	87.6	88.7	89.8	80.3	90.6	88.2	92.5	91.9	*84.4*	88.4

COMPARATIVE YEARLY SUMMARIES

	1937	1938	1939	1940	1941	1942	1943	1944
Year to Date..	79.8	71.5	83.4	85.6	97.4	90.4	87.8	*88.4*
Year Average..	79.8	71.5	83.4	85.6	97.4	90.4	87.8	88.4

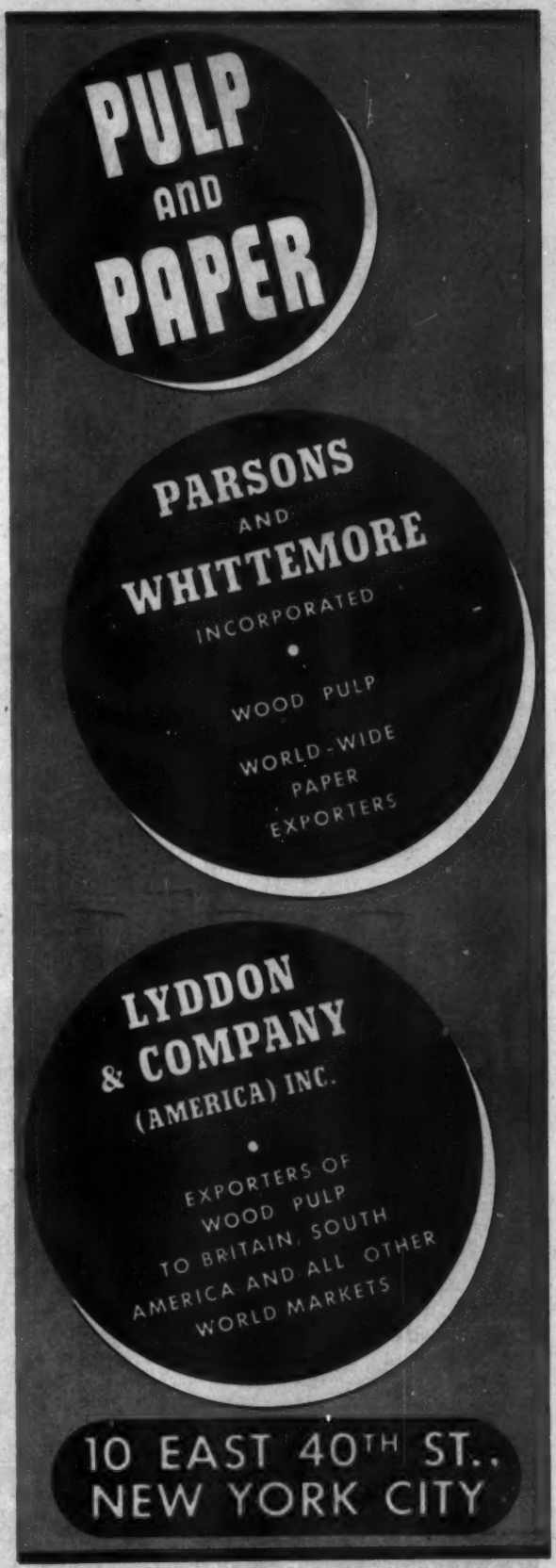
* Based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

PAPERBOARD OPERATING RATIOS†

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Avg.
1938	56	63	63	60	60	59	59	69	70	73	67	61	64
1939	65	73	76	74	69	73	68	77	82	91	88	77	77
1940	78	75	74	76	82	85	77	79	78	85	83	77	78
1941	81	88	89	89	91	94	92	98	95	99	98	90	92
1942	102	101	101	95	82	72	68	75	76	81	82	77	84
1943	86	88	94	94	96	94	89	96	94	94	93	87	93
1944	90	96	95	96	96	96	85	96	92	95	95	*85*	*93*

Week ending Nov. 25, 1944—91
Week ending Dec. 2, 1944—94
Week ending Dec. 9, 1944—95
Week ending Dec. 16, 1944—94
Week ending Dec. 23, 1944—94
Week ending Dec. 30, 1944—57

† Per cents of operation based on "Inch-Hours" reported to the National Paperboard Assn.



THREE JANUARIES IN A ROW

For three Januaries running, boring bar No. 5 has depicted Valley at War.

We hope there will not be a fourth. But the present tempo of gigantically increased operations on all fronts continues to call for maximum production effort to push on to Victory.

So, until this goal is reached, the new things we have in store for you to improve your post-war production must remain as blue prints—ready for immediate manufacture as soon as the signal is given.

VALLEY IRON WORKS CO.
APPLETON, WISCONSIN

Canadian Agents: Pulp & Paper Mill Accessories Ltd.
Dominion Sq. Bldg., Mont., P. Q.

Slices and Head Boxes • Screw Presses • Micro-Mist Spray Dampeners • Laboratory Equipment
Pulp Washing Systems • High-Speed Beaters • Breaker Beaters • Vortex Beaters • Plug Valves
Sutherland Refiners • Flat and Rotary Screens • Thickeners • Deckers • Paper Markers • Roll-Headers

Section of the
TECHNICAL ASSOCIATION
OF THE PULP & PAPER INDUSTRY
122 E. 42nd St., New York 17, N. Y.
Edited by R. G. Macdonald, Secretary

A Study of the Cuprammonium Viscosity of Cellulose Using the Hoeppler Viscosimeter

By W. O. Hisey[1] and C. E. Brandon[2]

Abstract

The study was made of the Hoeppler Viscosimeter for measurement of the viscosity of cuprammonium dispersed cellulose. It was found that this instrument was very satisfactory for this purpose and has an inherent error approximately one half as great as that of the TAPPI Standard T 206 m. The variables of the viscosity test were studied with the particular object of reducing the time required for viscosity determination. A rapid method was devised. It was found that the specific gravity of pulp dispersed in cuprammonium under TAPPI standard conditions was 0.945 instead of 0.96 as given in the standard method. It was also found that the tolerance for ammonia concentration given in T 206 m is too large for accurate work.

The viscosity of cellulose dispersed in various reagents has long been recognized as a means of measuring a fundamental property. Viscosity measurements are widely used for research on cellulose products and would be more widely used for control purposes if the techniques involved were more simple and rapid.

The study herein reported was undertaken with two primary objects, the first of which was to study the characteristics of the Hoeppler type viscosimeter and its suitability for use with cellulose dispersions, and the second of which was to evolve a method for the rapid determination of cellulose viscosity, yet with satisfactory precision. The method of study involved a systematic study of the principal variables involved in the cuprammonium viscosity test, and an evaluation of the errors by statistical means. Following this, experiments were made to produce rapid methods of testing.

Apparatus and Methods

Hoeppler Viscosimeter

An industrial model Hoeppler Viscosimeter was used for this study. This instrument is of the modified falling ball type, in which the solution to be tested is contained in a carefully ground glass tube of uniform diameter, mounted at an angle of 10 degrees from the vertical. This tube was surrounded by a water chamber for temperature regulation and control. Several spheres of varying diameter and specific gravity were provided for use with this apparatus. The diameter of these spheres is nearly as great as that of the tube, so that the action of the instrument is to force the material being tested through the annular space between the sphere and tube wall as the sphere descends in contact with one wall of the tube. By using spheres which vary in diameter and specific gravity it is possible to measure viscosities over a very wide range (0.0088 to 1,620,000 cp) and accurate grinding of tubes and spheres is said to result in an accuracy within 0.1% *(10)*. Only two spheres were used throughout this study, one of glass for the low viscosity range and one of steel for the higher viscosity range.

Preparation of Cuprammonium Solution

Cuprammonium solution was prepared for this work by a method essentially similar to that described in T 206 m, and solutions were analyzed by the procedures therein recommended. All solutions were stored in the dark at 70°F. and frequently analyzed No change in analysis was found after 4 to 5 weeks storage and no solutions of greater age than this were used.

Pulp Samples

The pulp used for most of this work was a highly purified cotton linter pulp. A series of tests was made with a variety of commercial and experimental pulps and papers for the purpose of comparing TAPPI standard methods with the Hoeppler method.

Cellulose Dispersion

The dispersion of the cellulose was, except where otherwise noted, carried out in glass tubes, ⅞ inch in diameter, closed with rubber stoppers. These tubes had a volume of approximately 80 cc. Agitation was obtained by clamping the tubes radially on a wheel of

[1] An abstract of a thesis presented to the New York State College of Forestry in partial fulfillment of requirements for the degree of Master of Science.
[2] Member of TAPPI; Associate Professor of Pulp and Paper Manufacture, New York State College of Forestry, Syracuse, N. Y.
[3] Member TAPPI; Chief Chemist, Aetna Paper Company, Dayton, Ohio.

36 inches in diameter, which was normally rotated at a speed of 3.3 r.p.m. but the speed of which could be varied as required. Several preliminary experiments were carried out to determine the effect of the material used in the tube to agitate the solution. Mercury was tried, according to the recommendation of Gershzon *(7)* and Tumarkin *(21)*, but without success, owing to the fact that the mercury broke up into small globules with no agitating effect. Comparative tests were also made with a ½ inch diameter steel sphere and glass beads. Since it was found that the viscosity results were identical, within the limits of experimental accuracy, the steel ball was used for further work. Agitation was carried out in a constant temperature room, at 70°F, and all tubes were wrapped to exclude light.

It is well known that a small amount of air *(11)* will greatly reduce the viscosity of cellulose dispersed in cuprammonium. In order to eliminate any such effect in this work, nitrogen was used to flush the tubes before filling, and to transfer the cuprammonium solution to the dispering tubes and from the dispersing tubes to the tester. In this way contact of the cuprammonium with air was entirely avoided. This technique was used in all cases, except special experiments on methods of rapid dispersion.

Variables of Viscosity Measurements

Specific Gravity of Dispersed Cellulose

The specific gravity of the dispersed cellulose enters the calculation for viscosity and was carefully determined for all solutions used by means of a Westphal balance. The results are given in Table I.

Examination of these data shows that:

a—Under TAPPI standard conditions the specific gravity of the pulp dispersion is 0.945 instead of 0.96 as given in T 206 m. These results check Kung,*(12)* who found a specific gravity of 0.94.

b—Increasing pulp concentration results in a small increase in specific gravity.

c—Increasing ammonia concentration results in a slight decrease in specific gravity.

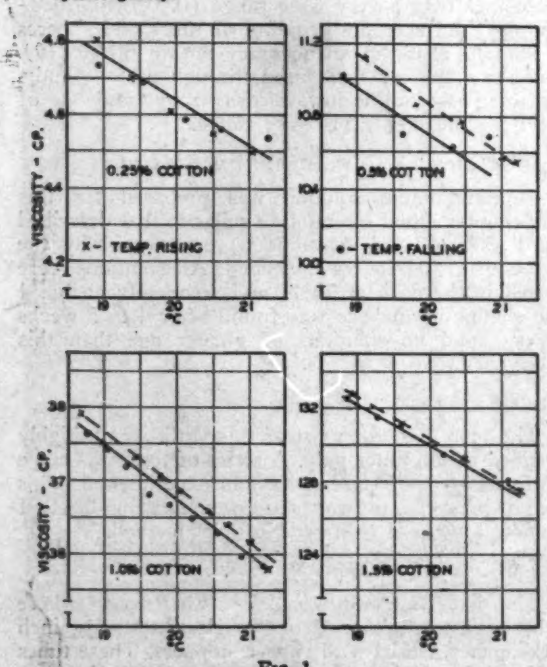


FIG. 1
Effect of Temperature on Viscosity

TABLE I.—SPECIFIC GRAVITY OF CUPRAMMONIUM CELLULOSE DISPERSIONS

Solution No.	Copper Conc. g./l.	Ammonia Conc. g./l.	Specific Gravity at Pulp Concentrations of 0.0%	0.25%	0.5%	1.0%	1.5%	Average
11	14.95	225	0.935	0.934	0.937	0.938	0.939	0.937
13	14.75	201.5	0.942	0.943	0.945	0.945	0.947	0.944
12	15.1	175	0.952	0.954	0.956	0.958	0.959	0.956
14	15.0	152	0.963	0.963	0.963	0.964	0.967	0.964
10	10.0	198	0.939	0.944	0.943	0.942	0.943	0.942
8	20.1	202	0.955	....	....	0.959	....	0.957
9	22.4	203	0.953	0.954	0.956	0.956	0.960	0.956
Average	....	....	0.948	0.949	0.950	0.952	0.953	....

Effect of Temperature on Viscosity

Since temperature is a very important variable in the determination of viscosity, a method for reducing test values to the standard temperature of 20°C was necessary. For this purpose a temperature correction factor was determined for the range 18.5 to 21.4°C. Water from a large crock was siphoned through the viscosimeter water chamber into a bucket below. When the bucket was full, the water was poured back into the crock and a small amount of warm or cold water was added to raise or lower the temperature as desired. The temperature was first raised to about 21.5°C., and then viscosity readings were made as the solution was cooled slowly. When a temperature between 18.5 and 19.0°C. was reached, it was maintained at that point for 1.5 to 2 hours, after which the temperature was again slowly raised to 21.4°C.

In order to remove some of the individual variations, the viscosity readings and temperatures were averaged in groups of three to five and the resulting averages plotted. The results are shown in Fig. 1 and Table II. It will be noted that the slope of the line is about the same whether the temperature was rising or falling but in the case of the 0.5%, 1.0%, and 1.5% solutions, the viscosity was slightly higher when the temperature was rising. Although the rate of temperature change was only about 1°C. per hour, there evidently was still some lag. The slope of the line indicates the following temperature corrections:

One-fourth per cent cotton	2.7% per degree
One-half per cent cotton	2.6% per degree
One per cent cotton	2.0% per degree
One and one-half per cent cotton	1.7% per degree

Effect of Dispersion Time on Viscosity

Since one of the purposes of this study was to determine a shorter dispersion method, a thorough study

TABLE II.—EFFECT OF TEMPERATURE ON VISCOSITY

Pulp Concentration %	Temperature Falling: Temp. °C.	Viscosity: Sec.	Viscosity: cp.	Temperature Rising: Temp. °C.	Viscosity: Sec.	Viscosity: cp.
0.25	21.26	161.0	4.543	18.88	170.5	4.811
	20.62	161.8	4.565	19.37	166.9	4.709
	20.13	162.5	4.585	19.92	163.3	4.608
	19.52	166.1	4.687	20.50	161.3	4.551
	18.92	167.8	4.735	21.05	159.3	4.495
0.5	21.15	352.7	9.972	19.10	393.4	11.123
	20.81	378.4	10.699	19.80	384.1	10.860
	20.33	375.8	10.625	20.46	381.0	10.772
	19.67	378.3	10.696	20.98	374.0	10.574
	18.84	390.3	11.035	21.16	373.1	10.549
1.0	21.23	63.2	35.83	18.68	66.8	37.87
	20.91	63.4	35.95	19.02	66.0	37.42
	20.56	64.0	36.29	19.38	65.8	37.31
	20.20	64.3	36.46	19.75	65.4	37.08
	19.90	64.7	36.68	20.04	65.0	36.85
	19.63	64.9	36.80	20.38	64.5	36.57
	19.30	65.6	37.19	20.71	64.2	36.40
	18.98	66.2	37.53	21.01	63.8	36.17
	18.78	66.4	37.65	21.25	63.1	35.78
1.5	21.10	229.9	128.0	18.95	238.1	132.6
	20.19	232.4	129.4	19.60	235.4	131.1
	19.29	235.9	131.4	20.45	232.1	129.2
	18.88	237.7	132.4	21.23	228.9	127.5

Note: All solutions were dispersed 16 hours by the standard method using cuprammonium solution No. 5 (TAPPI Standard). Solutions stood 1.5 hours at the low temperature before temperature rise was started. All tests given are averages of 3 to 5 falls. One-fourth and 0.5% tests were made with the glass sphere. One and 1.5% tests were made with the steel sphere. Rate of temperature change was approximately 1° C. per hour.

was made on the effect of variable dispersion time on viscosity. Pulp concentrations of 0.25, 0.5, 1.0 and 1.5% were used with each of seven different cuprammonium solutions. In each of the 28 cases a series of tests was made in which the dispersion time was varied.

Curves of viscosity against dispersion time were plotted for each series, all tests for a given dispersion time being averaged for each concentration. The results are given in Table III and the averages are plotted in Fig. 2. Examination of the curves of Fig. 2 shows the similarity of the effect of dispersion time at all pulp concentrations studied. There appears to be a characteristic tendency for viscosity to rise during the early period of dispersion, later dropping to an approximately constant value.

In order to compare the relationship between viscosity and dispersion time for the various solutions, all tests were calculated as a per cent of the average for that solution, so that tests for the different pulp concentrations were comparable. The results are given in Table IV. In four of the solutions the results were very regular, the viscosity increasing between the minimum dispersion time and the next longer time and then decreasing. In two other solutions the viscosity at 16 hours was below the average. It seems possible that if rapid solution is obtained, longer dispersion time does not affect the test; but if the dispersion is slow, the longer time causes a decrease in viscosity. The fact that the 0.25% pulp concentration, which was also rapidly dispersed, failed to show a decrease in viscosity with long dispersion seems to verify this assumption.

In summarizing, it seems from examination of all the data that as the fibers break up in the cuprammonium sufficiently to become invisible to the naked eye, the viscosity gradually increases due to the increase in pulp concentration but as these small bundles break down still further to individual cellulose molecules, the viscosity becomes lower.

In any case the decrease in viscosity after the preliminary dispersion has taken place is so slight that any dispersion time beyond the point where no particles are visible in the solution will give results within the accuracy of the instrument. However, it seems advisable, for the most accurate work, to select a definite dispersion time which should be at least twice the minimum time at which no particles are visible.

Effect of Wheel Speed on Viscosity

The speed of the wheel on which the dispersion tubes rotated was varied to determine the effect of this factor on viscosity. Speeds of 3.3, 9.3, 18.5, and 29.4 r.p.m., were used. In each case tests were made with four pulp concentrations at three or more dispersion times. The tests at the lowest wheel speed were made with a different cuprammonium solution and so were not used in this study. The other tests were made with a solution containing 201 grams ammonia and 14.75 grams copper per liter. The results

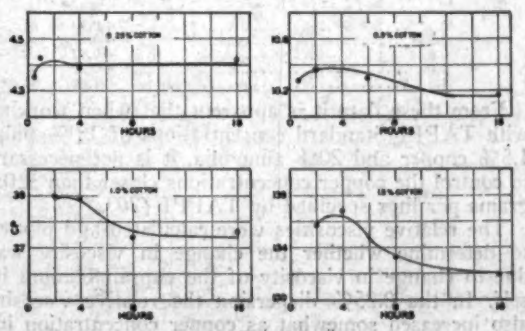


Fig. 2
Effect of Dispersion Time on Viscosity

TABLE III.—EFFECT OF DISPERSION TIME ON VISCOSITY
(Constant Pulp Concentration)

Pulp Conc.	Solution No.	Viscosity in cp. at Dispersion Time No. 1	No. 2	No. 3	No. 4	Average
0.25	10	4.046	4.227	4.052	4.227	4.138
	5	4.286	4.579	4.441	4.625	4.483
	8	4.496	4.507	4.605	4.338	4.487
	9	4.593	4.777	4.657	4.573	4.650
	11	4.199	4.026	4.122	4.253	4.150
	12	4.405	4.531	4.481	4.481	4.475
	14	4.449	4.335	4.357	4.471	4.403
Average		4.353	4.426	4.388	4.424	4.398
0.5	10	10.06	10.00	10.09	10.36	10.12
	8	10.16	11.12	11.13	10.54	10.74
	9	10.18	10.35	10.45	10.09	10.27
	11	9.35	9.26	9.18	9.19	9.25
	12	10.23	9.61	9.79	9.67	9.82
	12	10.69	10.78	10.87	10.76	10.77
	14	11.29	11.47	10.61	10.60	10.99
Average		10.28	10.37	10.30	10.17	10.28
1.0	10	37.32	37.96	36.38	37.69	37.34
	5	37.54	39.12	36.10	37.51	37.57
	8	37.50	37.77	37.99	36.25	37.38
	9	36.99	36.04	35.34	35.84	36.05
	11	32.01	32.02	32.24	32.00	32.07
	12	41.63	39.49	39.07	39.83	40.00
	14	43.09	43.17	43.22	42.06	42.89
Average		38.01	37.94	37.19	37.31	37.61
1.5	10	148.5	148.4	144.5	146.9	147.1
	5	133.7	129.5	140.0	130.6	133.4
	8	125.8	127.6	121.3	127.9	125.6
	9	117.8	119.0	114.2	113.1	116.0
	11	108.5	108.8	108.8	103.9	107.5
	12	145.9	141.3	138.3	139.6	141.3
	14	170.2	173.9	166.3	161.1	167.9
Average		135.8	136.9	133.3	131.9	134.5

TABLE IV.—EFFECT OF DISPERSION TIME ON VISCOSITY
(Constant Copper and Ammonia Concentration)

Solution No.	Pulp Conc. %	Per Cent of Average Viscosity at Dispersion Time No. 1	No. 2	No. 3	No. 4
10	0.25	97.78	102.15	97.92	102.15
	0.5	99.33	98.75	99.64	102.28
	1.0	99.96	101.66	97.44	100.93
	1.5	100.97	100.94	98.24	99.86
Average		99.51	100.88	98.31	101.31
5	0.25	95.61	102.16	99.06	103.17
13	0.5	94.57	103.52	103.71	98.19
5	1.0	99.92	104.15	96.08	99.84
5	1.5	100.20	97.03	104.89	97.87
Average		97.58	101.72	100.94	99.77
8	0.25	100.20	100.45	102.63	96.68
	0.5	99.16	100.80	101.81	98.24
	1.0	100.52	101.05	101.65	96.98
	1.5	100.14	101.56	96.52	101.78
Average		99.95	100.97	100.65	98.42
9	0.25	98.77	102.73	100.15	98.34
	0.5	101.16	100.15	99.32	99.38
	1.0	102.62	99.98	98.02	99.38
	1.5	101.53	102.58	98.42	97.47
Average		101.02	101.36	98.98	98.64
11	0.25	101.18	97.01	99.33	102.48
	0.5	104.02	97.85	99.66	98.45
	1.0	99.82	99.85	100.55	99.78
	1.5	100.92	101.18	101.23	96.68
Average		101.48	98.97	100.10	99.35
12	0.25	98.44	101.25	100.13	100.13
	0.5	99.23	100.06	100.86	99.85
	1.0	104.06	98.71	97.67	99.57
	1.5	103.28	99.98	97.90	98.83
Average		101.25	100.80	99.14	99.60
14	0.25	101.04	98.46	98.96	101.54
	0.5	102.74	104.33	96.48	96.45
	1.0	100.47	100.66	100.78	98.09
	1.5	101.38	103.60	99.06	95.96
Average		101.41	101.76	98.82	98.09
Grand Average		100.31	100.81	99.58	99.20

for the three dispersion times were averaged for each speed and pulp concentration to give the viscosity at each speed. When expressed as a percentage of the average for all speeds, the results were as follows:

Wheel Speed	9.3 rpm.	18.5 rpm.	29.4 rpm.
0.25% Cotton	96.52%	101.66%	101.79%
0.5% Cotton	98.88	99.09	102.02
1.0% Cotton	100.64	98.76	100.64
1.5% Cotton	100.18	98.83	101.00
Average	99.05%	99.59%	101.36%

These tests seemed to indicate that higher rotation speeds gave slightly higher viscosities, but since there was considerable variation, the tests cannot be taken as conclusive. The increase did not occur in the 1% and the 1.5% pulp concentrations using the steel sphere but only in the 0.25 and 0.5% concentrations using the glass sphere. It will be shown later that successive falls made by the glass sphere show increasing viscosity of the solution. Since this "viscosity rise" on the successive falls increased at higher wheel speeds, it is thought that the increase in viscosity with faster rotation was not a true increase but merely a variation in measurement caused by this "viscosity rise."

Effect of Copper Concentration on Viscosity

Many different concentrations of copper have been used ranging from 8 grams per liter used by Schuetz, Klauditz, and Winterfeld *(17)* to 30 grams per liter used by Genung *(6)* and Small *(19)*. The TAPPI Standard *(20)* for a cuprammonium solution is 15 grams per liter. It was early recognized *(8)* that the copper concentration must be controlled if the tests were to be reproducible. Small *(19)* allowed a variation of ±2 grams per liter for the copper in his solution but Genung *(6)*, who continued similar work, cut the allowable tolerance to ±0.5 grams per liter. The TAPPI Standard permits a variation of only ±0.2 grams per liter. In this study an attempt was made to control the copper concentrations to ±0.1 gram per liter. Tests were made at 0, 0.25, 0.5, 1.0, and 1.5% pulp concentrations using copper concentrations of 10.0, 15.0, 20.1, and 22.4 grams per liter. The ammonia concentration was held constant at 200 ±3 grams per liter. The exact ammonia concentration was determined and the viscosities were corrected sufficiently to give all results at 200 grams per liter. This correction, which was always small, was obtained from Fig. 4. All tests made with a given cuprammonium solution were averaged regardless of dispersion time, since dispersion time seemed to affect the viscosity only slightly. Furthermore, in each case tests were made at nearly the same dispersion times so that compensation was made for any difference in viscosity. Any tests that were not completely dispersed were omitted. The results obtained are given in Table V and Fig. 3.

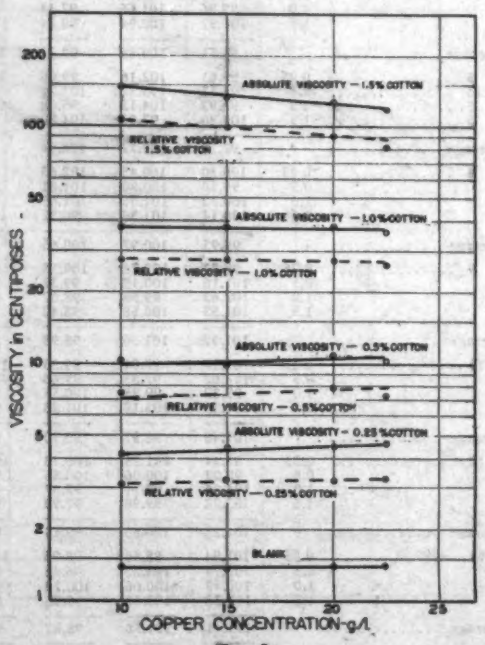


Fig. 3
Effect of Copper Concentration on Viscosity

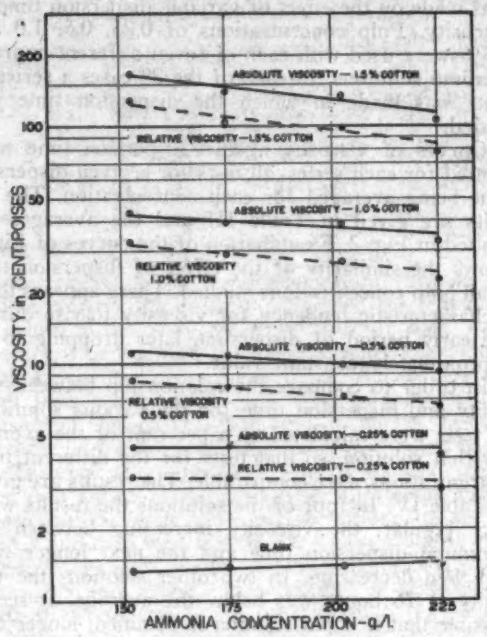


Fig. 4
Effect of Ammonia Concentration on Viscosity

Using the difference in absolute viscosities between copper concentrations of 10 and 20 grams per liter, the increase in viscosity due to an increase in copper concentration of one gram per liter, was calculated as a per cent of the viscosity at 15 grams per liter. The results were:

Pulp Concentration %	Change in Viscosity Due to an Increase in Copper of 1 gram per liter %
0	+0.33
0.25	+0.67
0.5	+0.92
1.0	+0.23
1.5	—1.32

From these data it is apparent that when working with TAPPI Standard concentrations of 1.0% pulp, 1.5% copper and 20% ammonia, it is not necessary to control the copper concentrations closer than ±0.2 grams per liter specified by TAPPI *(20)*.

The relative viscosities were calculated and plotted to determine whether the change in viscosity was due to change in viscosity of the cuprammonium itself. In the 0.25% dispersion the relative viscosity also increased somewhat as copper concentration increased but the increase was small enough to be within the errors of the experimental techniques.

Effect of Ammonia Concentration on Viscosity

In the present work, a study was made of the effect of ammonia concentration, using 152, 175, 202, and 225 grams per liter. Again tests were made at pulp concentrations of 0, 0.25, 0.5, 1.0 and 1.5%. The copper concentration was held as closely to 15 grams per liter as possible. Copper concentrations were carefully determined in all cases and where necessary corrected to 15.0 grams per liter. Since previous tests showed copper concentration to have little effect at low pulp concentrations, the only correction needed was on the 1.5% dispersions. Even here the correction was very small.

The results obtained from this study are given in Table VI and illustrated by Fig. 4. It was found in confirmation of Joyner's work *(11)*, that with pulp concentrations of 0.5% or over, higher ammonia concentrations gave lower viscosities. The 0.25% dispersion showed a slight increase in viscosity as the ammonia concentration increased from 150 to 200 grams per liter, but a slight decrease in viscosity was noted as ammonia concentration increased beyond this point. The viscosity of the cuprammonium solution without cellulose showed an increase in viscosity with increase in ammonia. When converted to relative viscosity all concentrations showed a viscosity decrease with ammonia increase.

Effect of Pulp Concentration on Viscosity

In this study tests were made with pulp concentrations of 0.1, 0.25, 0.5, 0.75, 1.0, 1.25, 1.5, 1.75, and 2.0%. The cuprammonium solution used contained 15 grams copper and 200 grams ammonia per liter. The glass sphere was used in measuring the viscosity of the concentrations of 1.25% and less while the steel ball was used for concentrations of 0.5% and more. The results are shown in Table VII and illustrated in Fig. 5.

The log of the relative viscosity was calculated and its reciprocal plotted against the reciprocal of the concentration. The line formed curved somewhat

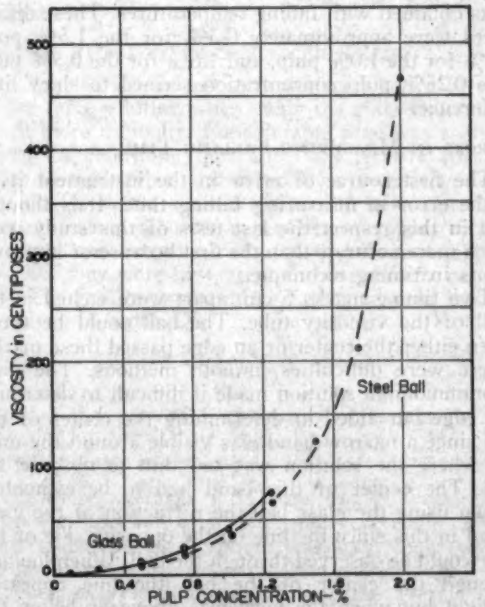


Fig. 5
Effect of Pulp Concentration on Viscosity

TABLE V.—EFFECT OF COPPER CONCENTRATION ON VISCOSITY

Pulp Conc. %	Copper Conc. g./l.	Absolute Viscosity cp.	Relative Viscosity	Increase/ gram %
0	10.0	1.358	....	.....
	15.0	1.371	....	0.19
	20.1	1.403	....	0.46
	22.4	1.416	....	0.40
0.25	10.0	4.16	3.07	.....
	15.0	4.48	3.26	1.55
	20.1	4.46	3.17	—0.09
	22.4	4.67	3.29	2.05
0.5	10.0	10.11	7.44	.....
	14.75	9.86	7.17	—0.52
	20.1	11.02	7.87	2.18
	22.4	10.34	7.31	—2.92
1.0	10.0	37.16	27.38	.....
	15.0	38.19	27.86	0.55
	20.1	38.03	27.12	—0.08
	22.4	36.53	25.79	—1.71
1.5	10.0	146.1	107.6	.....
	15.0	136.1	99.3	—1.37
	20.1	128.2	91.5	—1.14
	22.4	117.9	83.4	—3.50

rather than being straight as predicted by Hahn and Bradshaw *(9)*. When the log of the relative viscosity was plotted against the pulp concentration without first obtaining the reciprocal, the line obtained was straight except for the very low concentrations.

Effect of Plasticity on Viscosity

Solutions of cellulose in cuprammonium have some plasticity. Phillips *(13)* ran a series of tests with a falling sphere tester using different weight balls and calculating the viscosity according to Ladenburg's equation. He obtained a straight line when the tests were made on caster oil but when made on cellulose nitrate he obtained a curve. This was assumed to be caused by plasticity. Carver and Folts *(3)* made tests using a Gingham and Green instrument. They used cellulose dissolved in Schweitzer's reagent and found a marked drop in viscosity as the pressure was increased. For example, at 1000 dynes pressure a viscosity of 160 poises was obtained, while at 4000 dynes it had dropped to 13 poises.

It will be noted from the curves of Fig. 5 that the viscosities obtained when using the glass sphere were always higher than those obtained with the same concentration using the steel sphere. A number of tests were made using both balls in the same solution to determine the magnitude of their effect. Several different pulps were used so that a wide range of viscosities could be studied. The cuprammonium solutions in all cases were TAPPI standard. The pulp concentration was 1.0% for all pulp except the cotton, where it was 0.1 and 0.5%. The results are given in Table VIII.

In Fig. 6 the ratio of glass sphere viscosity to steel sphere viscosity has been plotted against the viscosity as obtained by the steel sphere. The straight line ob-

TABLE VI.—EFFECT OF AMMONIA CONCENTRATION ON VISCOSITY

Pulp Conc. %	Ammonia Conc. g./l.	Absolute Viscosity cp.	Relative Viscosity	Change/ gram %
0	152	1.302	....	.....
	175	1.366	....	+0.22
	202	1.373	....	+0.02
	225	1.416	....	+0.14
0.25	152	4.40	3.38	.....
	175	4.46	3.26	+0.06
	202	4.48	3.26	+0.02
	225	4.13	2.92	—0.37
0.5	152	10.99	8.44	.....
	175	10.77	7.89	—0.09
	201.5	9.82	7.14	—0.33
	225	9.24	6.53	—0.25
1.0	152	42.9	32.9	.....
	175	39.5	28.9	—0.35
	202	37.9	26.8	—0.13
	225	32.1	22.7	—0.67
1.5	152	167.9	128.9	.....
	175	141.6	103.7	—0.68
	202	134.4	97.9	—0.16
	225	107.4	75.8	—0.70

TABLE VII.—EFFECT OF PULP CONCENTRATION ON VISCOSITY

Ball Used	Pulp Conc. %	Absolute Viscosity cp.	Relative Viscosity	1/log. Rel. Vis.
Glass	0.1	2.29	1.66	4.54
	0.25	4.48	3.25	1.955
	0.5	10.10	7.33	1.157
	0.75	20.53	14.90	.852
	1.25	76.57	55.56	.573
Steel	0.5	9.08	6.60	1.220
	0.75	17.82	12.93	.898
	1.0	36.10	25.20	.713
	1.25	66.21	48.05	.594
	1.5	123.3	89.5	.512
	1.75	210.7	152.9	.458
	2.0	467.0	338.5	.393

TABLE VIII.—PLASTICITY OF CELLULOSE DISPERSIONS

Pulp	Absolute Viscosity Glass cp.	Steel cp.	Glass/Steel
0.1% Cotton	2.29	2.23	1.026
0.5% Cotton	10.10	9.08	1.111
Paper C	13.6	11.7	1.162
Bleached kraft No. 4	16.35	14.07	1.162
Bleached kraft A	16.7	13.78	1.212
Bleached kraft No. 5	19.45	15.64	1.243
Paper B	20.3	15.9	1.278
Paper A	21.3	16.8	1.269
Unbleached kraft No. 1	34.6	24.75	1.400
Unbleached kraft No. 3	49.4	32.0	1.545

tained indicates that if the ratio of tests made with the glass sphere to tests made with the steel sphere can be taken as a measure of plasticity, a linear relationship exists between plasticity and viscosity. The higher the viscosity, the greater the discrepancy between the two tests.

Accuracy of Tests with the Hoeppler Viscosimeter

Sources of Error

Measurement of viscosity of cellulose dispersions is subject to many errors. These may be divided into four main groups:

1. Errors in making the dispersion
2. Errors in temperature correction
3. Errors in measuring falling time
4. Differences in falling time

Errors in Making the Dispersion

If viscosity tests are to be reproducible, it is important that the copper and ammonia concentration be constant. For accurate work the same batch of cuprammonium should be used for all tests and the solution should be kept at a sufficiently low temperature to prevent the loss of ammonia. Since these precautions were observed in this work, there should have been little error from this source.

The second source of error in making the dispersion is variation in pulp concentration. It has been shown that an error of 1.0% in pulp concentration causes an error in viscosity of about 3.0%. Errors in pulp concentration can come from weighing the pulp and transferring it into the dispersing tubes or in the measurement of solution volumes.

In this study, all pulps were conditioned for several days at 65% R.H. after which samples were removed for moisture tests and the remainder of the pulp sealed in fruit jars. The samples for viscosity were weighed on glazed weighing paper at 65% R.H. to prevent change in moisture content. They were weighed on an analytical balance to the nearest 0.0002 gram. This represented an error of 0.15% in the 0.25% tests but only 0.029% at 1.5%. The moisture content of the pulp was not this uniform even in a conditioned room. The accuracy of weighing was probably between 0.25 and 0.1%, depending on the concentration.

The third source of error in making the dispersion comes from slight differences in the pulp itself or from degradation caused by minute but variable amounts of air which are almost certain to be present. Since the pulps used for this study were very uniform, the first of these errors was rather small, but the error due to degradation was difficult to determine.

Errors in Temperature Correction

As has been shown, there was considerable change in viscosity with change in temperature, for which correction was made. The error came in determining the exact temperature. A thermometer was supplied with the viscosimeter which measured the temperature of the water bath to 0.02°C. However, if the temperature was changing, there was a lag in the measurement. The importance of this was shown in the discussion of the effect of temperature on viscosity, since, although the rate of temperature change was only about 1°C. per hour, the results obtained with rising temperatures differed appreciably from the results obtained with falling temperatures. These differences were approximately 0.3% for the 1.5% pulp, 0.5% for the 1.0% pulp, and 1.6% for the 0.5% pulp. The 0.25% pulp concentration seemed to show little difference.

Errors in Measuring Falling Time

The first source of error in the instrument itself is the error in measuring falling time. It is thought that in this respect the last tests of this study were much more accurate than the first because of improvements in timing technique.

Two timing marks 5 cm. apart were etched in the wall of the viscosity tube. The ball could be timed when either the center or an edge passed these marks. There were difficulties in both methods. The dark cuprammonium solution made it difficult to determine the edge but aided in determining the center of the ball since a narrow band was visible around the middle where the solution was too thin to obscure the ball. The center of this band had to be estimated. When using the glass ball the refraction of the glass aided in this since the line on the opposite side of the tube could be observed through the ball. When looking through the center of the ball the line appeared straight but when the view was above or below the center, the refraction of the glass caused it to look curved. This refraction made center timing satis-

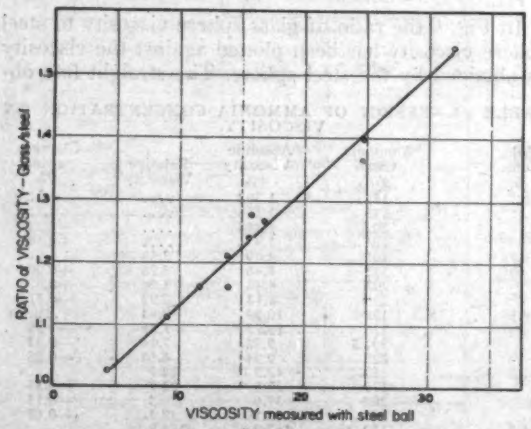


FIG. 6

Plasticity Effect in Viscosity Measurement, As Shown by the Ratio of Viscosity Measured with the Glass Sphere to That Measured with the Steel Sphere

factory for the glass ball, but center timing for the steel ball was never very accurate.

Several methods were used to obtain a sharp image of the edge of the ball. A flashlight held at such an angle that the main beam was directed downward rather than directly at the observer but in such a position that the filament of the bulb could be seen through the solution at the end of the fall, proved very satisfactory. Since this method gave a very sharp end-point with the steel ball, it was used exclusively on the last half of the tests made. The maximum error from this source using this method was probably not more than ±0.2 mm. which would be ±0.4%. In all probability the actual error was less than this. For most of the tests with the glass ball two stopwatches were used and the timing done from both center and edge. The two results were then averaged to give a more accurate falling time than either method alone. However, the maximum timing error was still greater than it was for the steel ball.

In this study a stopwatch measuring 0.2 seconds was used for timing. In extremely fast falls this measurement limitation was the factor determining the accuracy of timing. On a 1.0% dispersion of cotton with a falling time of 67 seconds, 0.2 seconds represented an error of about 0.3%.

Differences in Falling Time

The second source of error in the instrument itself is the actual difference in falling time. This may be an irregular difference caused by such things as small impurities in the solution which hinder the fall of the ball, improper mixing which gives a variable solution through the tube, irregularities in the ball, or a regular difference caused by some factor which always causes a change in the same direction. The regular change would be partially compensated for if the same number of tests were made each time. Very little difficulty was observed with the irregular differences although small particles of copper caused trouble once or twice when using high copper concentration.

Rise in Viscosity on Successive Tests

A regular rise in viscosity during a series of tests in the same solution when using the glass ball caused much more difficulty. Considerable time was spent in trying to determine the cause and remedy for this error in testing but a satisfactory answer was never found. To obtain a clear picture of how much rise was occurring, all tests regardless of copper or ammonium concentration were averaged according to whether they were first, second, third, fourth, or fifth fall. The results expressed as falling time in seconds are given in Table IX.

TABLE IX.—CHANGE IN FALLING TIME ON SUCCESSIVE FALLS

Fall No.	1	2	3	4	5
1.5% Cotton, steel ball, sec...	229.9	229.9	230.0	229.9	.....
1.0% Cotton, steel ball, sec...	66.72	66.76	66.81	66.73	66.72
0.5% Cotton, glass ball, sec...	356.8	363.7	368.3	371.1	372.3
0.25% Cotton, glass ball, sec..	150.2	154.0	156.4	157.4	158.4

From these averages it is seen that the variations when the steel ball was used were very slight. However, when the glass sphere was used there was a regular increase in viscosity on succeeding falls.

When expressed as per cent of the average, the results with 0.25 and 0.5% cotton are:

Fall No.	0.25% Cotton Glass Ball %	0.5% Cotton Glass Ball %
1	96.72	97.38
2	99.16	99.26
3	101.71	100.52
4	101.29	101.28
5	102.00	101.61

Thus it is seen that the increase was about the same in both cases, although the 0.25% concentration seemed to show a slightly larger change. That this was definitely an increase and not just a variation in the test was proven by the fact that in eighty sets of tests studied, 79 showed a rise in viscosity between the first and fifth fall while only one showed a drop. In this one case the drop was very small.

Effect of Other Variables on "Viscosity Rise"

Although the viscosity rose in 79 out of eighty cases when only the glass sphere was used, this rise was not always the same, varying up to 13.3%. In order to determine the cause of this, the results were studied with respect to the several variables in the test with the following results:

1. In sixteen out of twenty cases the rise was greater at 16 hours dispersion time than at the minimum dispersion time. In most of these cases the difference gradually increased as dispersion time increased. In the four cases showing a decrease the change was small. In only one case did a marked decrease exist. Thus it seemed certain that the shorter the dispersion time, the smaller the "viscosity rise."

2. Using the viscosities at a given dispersion time and comparing the effect of copper concentration, it was found that for 0.25% cotton, increase in copper concentration showed an increase in "viscosity rise" at all dispersion times but with 0.5% cotton, copper concentration seemed to have no effect. Therefore, the effect of copper concentration was questionable.

3. A similar study of ammonia concentration showed no definite trend although higher ammonia concentrations seemed to give somewhat greater "viscosity rises."

4. Increase in wheel speed caused a greater rise in viscosity at a given dispersion time.

Effect of Standing on "Viscosity Rise"

Several tests were made in which the solution was permitted to stand for various lengths of times before testing. Standing in the dispersion tube before transferring to the tester seemed to do little good. In a few cases the standing seemed to decrease the "viscosity rise" but since a repeat test would not give the same result, it is probable that it was merely a variation in the test.

Standing in the tester after transferring was tried. A sample which stood in the tester for 2 hours with the tester in the inverted position showed one of the largest "viscosity rises" obtained on any test. However, if the tester stood in an upright position between the first and second fall a very large rise occurred between these two falls but very little after the second one.

Effect of Brass Plug on "Viscosity Rise"

Since standing in an upright position in the tester seemed to eliminate the "viscosity rise" and standing in any other position seemed to have no benefit, it was thought that perhaps the brass plug in the tester caused the change. Tests were made in which the rubber plug replaced the brass one. The first test showed a rather small "viscosity rise" but in repeat

tests the rise was just as great as with the brass plug indicating that the plug had no effect.

Possible Cause of "Viscosity Rise"

The following points seemed to have a definite effect on the viscosity rise:

1. Decreasing agitation either by lowering wheel speed or shortening dispersion time decreased the "viscosity rise" but did not eliminate it.
2. Permitting the solution to stand in the tester placed in an upright position eliminated the "viscosity rise" but gave high results.
3. The placing of two balls in the solution caused a drop in viscosity rather than a rise but also gave high results.

A satisfactory explanation of these phenomena could not be discovered. The effect might have been due to small bubbles in the solution which collected on the glass sphere. This reduced the specific gravity slightly and also reduced the size of the annulus somewhat, thus causing a "viscosity rise." There were several points supporting this theory. First, the bubbles were present and could be seen on the glass sphere when making a test. Second, the bubbles did not move up past the glass sphere but did move past the steel sphere. Thus no "viscosity rise" could be expected with the steel ball and none was found. Third, if bubbles were the cause, greater agitation should have caused greater "viscosity rise," which was found to be true.

If this explanation is correct, all results with the glass sphere were high and the first test was the most accurate. This seems possible since the glass ball did give higher results than the steel ball on the same solution. Calculations included in a following section show that the first test does seem more accurate than the last.

Other explanations of the "viscosity rise" should be investigated in further work to determine whether they are more plausible than the "bubble theory." Other possible explanations to be considered are:

1. That it is a plasticity phenomenon.
2. That it is an electrical phenomenon in which the glass ball takes on electrical charges.
3. That there is some basic change in the solution itself.
4. That there is a building up of a "skin" on the tube or ball, or on both.

None of these explanations may be correct but if tests are to be made with accuracy with the glass sphere a remedy must be found for the "viscosity rise." Since the rise is always present, there is a tendency to compensate if five tests are always used. That was done in this study but since this rise was very irregular the results are of necessity not so accurate as desired.

Statistical Methods Used in Calculating Errors

In order to obtain some numerical comparison of the accuracy of various methods, the results were studied using the statistical methods described by Simmonds and Doughty *(18)*. When mean deviations from the average were calculated, a correction was always made for the error due to the small number of tests. This was done by dividing the calculated mean deviation by the following factors taken from the curve given in the article by Simmonds and Doughty *(18)*.

The mean deviation of the average for five falls was calculated, and the maximum error was taken as twice the mean deviation: therefore, it would be exceeded by chance only once in 22 times.

3 tests	0.750	12 tests	0.932
4 tests	0.800	15 tests	0.948
5 tests	0.830	20 tests	0.960
6 tests	0.860	25 tests	0.972
7 tests	0.880	30 tests	0.978
8 tests	0.895	40 tests	0.988
9 tests	0.905	50 tests	0.990
10 tests	0.915	75 tests	0.992
11 tests	0.925		

Instrumental Error

To obtain a measure of the instrumental error in case of a given solution, mean deviations of the individual falling times from the average falling time were calculated. All tests were used except (1) those which were not completely dispersed, (2) those in which the temperature went so high that an accurate temperature correction could not be made, and (3) those in which the process was varied in some way, such as permitting the solution to stand before testing. These mean deviations were corrected for the number of tests as stated above after which per cent mean deviation was determined. These per cent mean deviations were averaged for each pulp concentration to give an average mean deviation. From this was calculated the mean deviation and maximum error for an average of five falls. The maximum errors obtained for various pulp concentrations were:

0.25% pulp concentration	2.20%
0.5 % pulp concentration	1.78%
1.0 % pulp concentration	0.44%
1.5 % pulp concentration	0.42%

For the 1.0 and the 1.5% concentrations these would be equal to the instrumental error since there was no "viscosity rise" on successive falls. For the 0.25 and 0.5% concentrations these results were really too large. They would represent the instrumental error if any five falls were used rather than just the first five but in this study the first five falls were always used thus compensating somewhat for this change. In order to determine the accuracy under these circumstances, corrections were made in each test using the average values previously obtained to show average "viscosity rise." The average falling times and corrections are given in Table X.

New mean deviations were then calculated from the corrected values. The maximum error of an average of five falls was calculated as before. The maximum errors now obtained were 1.36% for the 0.25% pulp concentration and 1.20% for the 0.5% pulp concentration. These values should be used when determining whether or not a difference in the results was significant.

This still does not give the probable error in the instrument when used under one set of conditions. To obtain a value for this, the tests made for determining temperature corrections were used. By omitting the first few falls the effect of "viscosity rise" was eliminated. The remaining tests were corrected to 20°C., and a mean deviation from the average was calculated for each pulp concentration. The number of tests used for this calculation ranged from fifteen for the 0.5% concentration to 75 for the 1.0% concentration. From the mean deviation of the individual falls the maximum error for the average of five falls was determined with the following results:

0.25% pulp concentration	0.58%	maximum error
0.5 % pulp concentration	0.61%	maximum error
1.0 % pulp concentration	0.44%	maximum error
1.5 % pulp concentration	0.38%	maximum error

Hoeppler *(10)* claimed an accuracy of 0.1% for the instrument. No calculations in this study showed the instrument to be this accurate, but the error was less than 1.0%. All tests indicated that when five tests were averaged, the error in 21 out of 22 cases

was less than 0.4% if the steel ball were used. Even a single test would have had a maximum error of less than 1%. When using the glass ball, the maximum error was somewhat larger being approximately 0.75% if all conditions were carefully controlled. At variable dispersion times the error was sometimes over 2.0%. This was undoubtedly due to the variable "viscosity rise."

Overall Error

These calculations of instrumental error did not give the actual accuracy of one test to another. The viscosity was measured with less than 1.0% error but to make two cellulose dispersions in which the viscosity varied by less than 1.0% was more difficult. To determine this "over-all error" the two series of five check tests using 0.25 and 1% pulp concentrations were studied. The results are given in Table XI.

It should be noted here that the error in making the solutions was much greater than the instrumental error. Although the maximum instrumental error for 1.0% cotton based on these same tests was only 0.28%, the over-all maximum error was 2.2%. In the 0.25% concentration the instrumental error was 0.7% but overall error was 1.76%.

As a further check on the overall error, mean deviations were calculated for each cuprammonium solution used. Since the dispersion time varied, it was necessary to assume that the dispersion time did not effect the test. The results are given in Table XII. The results of the calculations expressed as maximum error in per cent of a single test were as follows:

0.25% pulp concentration	4.7% maximum error
0.5 % pulp concentration	4.4% maximum error
1.0 % pulp concentration	3.0% maximum error
1.5 % pulp concentration	5.3% maximum error
Average	4.35% maximum error

TABLE X.—CORRECTIONS USED IN CALCULATING INSTRUMENTAL ERROR

	0.25% Pulp		0.5% Pulp	
Fall No.	Falling Time (sec.)	Correction (sec.)	Falling Time (sec.)	Correction (sec.)
1	150.2	+5.1	356.8	+9.6
2	154.0	+1.3	363.7	+2.7
3	156.4	−1.1	368.3	−1.9
4	157.3	−2.0	371.1	−4.7
5	158.4	−3.1	372.3	−5.9
Average	155.3		366.4	

TABLE XI.—OVERALL ERROR AS CALCULATED FROM SPECIAL DUPLICATE TESTS

	Pulp Concentration 0.25% cp.	1.0% cp.
Test No. 1	4.20	35.0
Test No. 2	4.25	34.2
Test No. 3	4.19	35.0
Test No. 4	4.17	34.6
Test No. 5	4.22	34.9
Mean deviation, %	.68	.85
Corrected mean deviation, %	.88	1.10
Maximum error of a single test, %	1.76	2.20

TABLE XII.—MEAN DEVIATION FROM THE AVERAGE OF THE VISCOSITY OF CELLULOSE DISPERSIONS

	Per Cent Mean Deviation				
Solution No.	0.25%	0.5%	1.0%	1.5%	Average
5	2.55	...	2.72	4.15	3.14
8	2.31	2.84	.64	2.80	2.15
9	2.40	1.74	2.08	2.98	2.30
10	2.24	1.68	1.94	1.69	1.89
11	3.00	1.14	.37	2.41	1.73
12	1.07	.73	1.04	2.20	1.26
14	1.63	4.47	1.40	3.50	2.76
13	3.69	2.84	1.74	1.50	2.44
Average	2.56	2.20	1.49	2.65	2.18

Note: In making these calculations it was assumed that dispersion time had no effect on the viscosity.

By using the viscosities given in Table III, it was possible to make calculations in which dispersion time was not a factor. The assumption was made that the average of all dispersion times for a given solution was the correct viscosity. The algebraic difference between this test and the tests at each dispersion time was then calculated. Next, all the differences for a given dispersion time and pulp concentration were averaged algebraically and mean deviations of the differences were calculated. This last operation served to correct for any regular difference in viscosity due to variable dispersion time. By using the difference from the average for a given solution rather than the actual viscosity, it was possible to calculate the mean deviation between tests made with variable cuprammonium solutions even though the actual viscosity showed considerable difference. The results of the calculations are given in Table XIII.

The average mean deviation for all concentrations was 2.18% or a maximum error of 4.36%. This agreed with the 4.35% maximum error obtained by the other method of calculations. From this it was evident that although the maximum instrumental error was less than 1%, when the error in making the solution was included, the maximum overall error was 4.0% to 4.5%. When all procedure was carefully standardized, as was done in the special tests for calculating error, this was reduced to a maximum error of 2 or 3%.

Effect of Pulp Concentration on the Accuracy of the Tests:

Several sets of calculations have already been given in which the effect of the pulp concentration on the accuracy of the tests was shown. Probably the most accurate are those given in Table XIII. In drawing conclusions from any of these tests, it must be remembered that the 0.25 and 0.5% concentrations had high results due to the effect of "viscosity rise" and that this effect was greater in the 0.25% than in the 0.5% concentrations. When these points are considered, it seems that the higher the pulp concentration the lower the instrumental error but the higher the over-all error.

Relative Accuracy of Different Cuprammonium Solutions:

To determine whether copper or ammonia concentration had any effect on test reproducibility the results given in Table XII for various solutions were averaged for all pulp concentrations. Solutions 10, 5, 8, and 9 contained respectively 10, 15, 20, and 22.4 grams copper per liter with 200 grams ammonia per liter. The tests showed considerable variation in mean deviation but since the mean deviation was calculated on such a few tests, this difference might not have been significant. Solution 5 containing 15 grams copper was used before the best methods of timing were determined and may have shown a little greater variation for this reason. Solutions using 10, 20, and 22.4 grams copper per liter gave mean deviations of 1.89, 2.15, and 2.30% respectively. This suggested that a lower copper concentration was more reproducible but the difference might have been caused entirely by chance variation in the tests.

Solutions 11, 5, 12, and 14 contained respectively 225, 200, 175, and 150 grams ammonia per liter with 15 grams copper. The mean deviations of 1.73, 3.14, 1.26, and 2.76% respectively did not show any regularity. Again the 3.14% was probably high because of

the method of timing. Although the variation was too great to draw any accurate conclusions it was quite possible that either too high or too low ammonia concentration did cause less reproducible results.

TABLE XIII.—RELATIVE ACCURACY OF DIFFERENT DISPERSION TIMES

Dispersion Time	Per Cent Mean Deviation for Pulp Concentration of				
	0.25%	0.5%	1.0%	1.5%	Average
Shortest	2.13	3.29	1.79	1.18	2.09
1st intermediate	2.20	2.56	1.82	2.33	2.23
2nd intermediate	1.56	2.48	2.13	2.82	2.25
16 hour	2.52	1.93	1.97	2.26	2.17
Average	2.10	2.56	1.93	2.15	2.18

TABLE XIV.—COMPARATIVE ACCURACY OF FIRST AND FIFTH FALLS

Pulp Conc.	Solution No.	Viscosity cp.	Per Cent Mean Deviation		
			1st Fall	5th Fall	Average*
0.25%	10	4.16	1.8	2.9	2.2
0.25%	5	4.48	3.3	2.3	2.6
0.25%	8	4.46	1.3	3.2	2.3
0.25%	9	4.67	1.7	1.6	2.4
0.25%	11	4.13	0.8	3.5	3.0
0.25%	12	4.46	2.4	1.9	1.1
0.25%	14	4.40	0.6	1.9	1.6
Average			1.7	2.5	2.2
0.5%	10	10.16	1.0	3.5	1.7
0.5%	13	9.82	2.3	3.1	3.0
0.5%	8	10.98	1.6	3.0	2.8
0.5%	9	10.27	2.3	1.7	1.7
0.5%	11	9.24	0.3	2.2	1.1
0.5%	12	10.77	1.2	2.2	0.7
0.5%	14	10.99	4.3	4.3	4.5
Average			1.9	2.9	2.2
Grand Average			1.8	2.7	2.2

* Average of five falls.

Relative Accuracy of Different Dispersion Methods:

In order to determine whether a longer dispersion time gave more reproducible results, the mean deviations at various dispersion times were averaged for all pulp concentrations, and the results are given in Table XIII. As the dispersion time increased from the minimum to sixteen hours, the mean deviation showed little variation. This indicated that an increase in dispersion time had little effect on the accuracy of the viscosity tests.

Relative Accuracy of Different Timing Methods:

When using the glass sphere, the falling time was measured from both the center and lower edge. To determine whether there was any difference in the accuracy of these two methods of timing, mean deviations were calculated for the average "edge" tests and the average "center" tests using the five 0.25% concentration tests made for determining instrumental accuracy. These gave a mean deviation of 0.87% for the "edge" tests and 0.91% for the "center" tests. Evidently the two methods of timing were about equal in accuracy.

Relative Accuracy of the First and Last Fall:

The five special tests for determining instrumental accuracy were again utilized to determine the relative accuracy of the first and last fall when the glass sphere was used. Mean deviations for the five tests were calculated with these results:

Mean deviation of the first falling time	0.78%
Mean deviation of the fifth falling time	1.68%
Mean deviation of the average falling time	0.85%

This indicated that the first fall was much more accurate than was the fifth fall and even a little more accurate than the average of the five falls. Apparently the first fall was the more nearly correct one and as the "viscosity rise" occurred the tests became too high. Since most of the methods which tended to eliminate "viscosity rise" gave tests similar to the last fall, they may have given false results. Further study should be made on this point. From these tests it would appear better to measure only one fall and take this as the viscosity of the solution.

To further verify this point, mean deviations were calculated on the first and last falls using the various dispersion times for each cuprammonium solution. The same tests were used as before when mean deviations were calculated on the average tests. Again the first fall gave a mean deviation less than either the last fall or the average of five falls. This verified the results found on the few tests previously studied. These results are given in Table XIV.

(To be concluded)

Warns Against Acute Paper Shortages

In a statement issued by E. W. Tinker, executive secretary of the American Paper and Pulp Association on January 5, he points out that the economic position of the manufacturers of paper is developing to a point that may drastically affect paper production in 1945. Wartime controls of production and prices have so altered the cost-price relationship in paper manufacturing that the primary manufacturers have been operating under decreasing returns since early in 1942. During 1944 paper prices remained fixed, whereas costs have increased materially in the following items: pulp prices; waste paper prices; pulpwood prices; average weekly earnings; labor cost per ton; and in practically all miscellaneous supplies.

The manufacturers of paper have in effect been caught in a "squeeze play" that is already beginning to affect production and which, if it continues on the basis of present trends, will inevitably drastically curtail the available supply for essential military and civilian usage. The situation has all the potentialities of another acute national shortage.

With the prospects for continued general cost increases, Mr. Tinker stated that it appeared almost inevitable that many marginal paper mills will be obliged to close down and he pointed out further that idle paper mill capacity is already with us and added that under the rigid controls that rule the pulp and paper industry at this time, such controls having been established as the result of the war economy, the problem was one that deserved the earnest consideration of the controlling Government agencies. Lacking such consideration and remedial action it appears inevitable that the existing paper shortage will be aggravated to a point that will seriously affect the country's economy.

The situation with respect to pulpwood and waste paper supplies is growing increasingly acute which, in large part, may be attributed to the economic picture within the industry.

M. C. Stinson Made Superintendent

Thompson, N. Y., January 8, 1945—M. C. Stinson has been appointed superintendent of the mill of the United Paperboard Company, Inc., at this place. Mr. Stinson began his new duties January 1.

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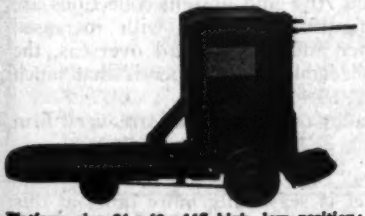
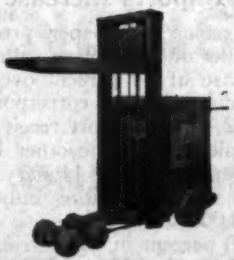


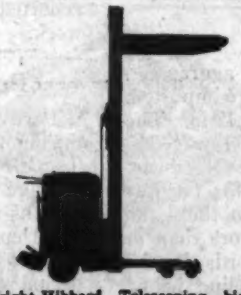
Platform size 24 x 42 x 11" high, low position; 18" high when elevated. Capacity: 2000, 3000, and 4000 pounds.

Capacity 2000 lbs. on forks 30" long. Truck turns from a 5' aisle into an intersecting aisle of 5'.

Weight of 4000 lbs. capacity—2850, without battery. Truck turns from a 5' 6" aisle into an intersecting aisle of 4'.



Platform 24" wide, 53" long and 11" high, low position. Capacity 2000, 3000 and 4000 pounds.



The Wright-Hibbard Telescoping high lift truck is designed to operate in the most congested areas of factories and warehouses. The exceptionally narrow width and short overall length found in other Wright-Hibbard trucks are retained in this model.

Platform 24" wide, 42" long and 9" high, low position. Weight of 4000 lb. capacity—3800 without battery.

New York Paper and Pulp Market Review

OPA Freezes Book Paper Manufacturers' Prices At High Level of First 1944 Quarter — Wood Pulp Situation Deteriorating For Paper For Civilian Use — More Waste Paper Urgently Needed.

Office of the PAPER TRADE JOURNAL,
Wednesday, January 10, 1945.

All government, industry and trade reports concerning paper reflect the critical supply situation. All present indications point to a most acute period in the near future. No substantial improvement in civilian supply can be looked for until government needs are decreased. This possibility, according to government sources, is dependent upon the end of the war in Europe.

OPA Amendment 5 to MPR-451—Book Paper, which became effective on January 5, 1945, has frozen quotations at the highest lawful prices in effect in the first 1944 quarter. This applies to all book papers sold by manufacturers to wholesale paper merchants or to the Federal Government.

The index of general business activity for the week ended December 30 declined to 138.4, from 142.4 for the preceding week, compared with 142.3 for the corresponding week last year. The index of paper board production was 116.0, compared with 149.5 for the previous week, and with 124.8 for the corresponding week last year.

Paper production for the week ended December 30 was estimated at 61.0%, compared with 73.6% for 1943, with 102.2% for 1942, with 80.8% for 1941, and with 88.0% for the corresponding week in 1940.

Paper board production for the week ended December 30 was 57.0%, compared with 62.0% for 1943, with 86.0% for 1942, with 59.0% for 1941, and with 65.0% for the corresponding week in 1940.

Prospects for this year, according to W. L. R. Neubrech, Chief of the Pulp and Paper Unit, Bureau of Foreign and Domestic Commerce, are as follows: "Viewing 1945 as a whole, the answer as to whether paper supplies for civilian uses become increasingly short as the year advances, will depend upon: (1) Ability of the domestic industry to sustain pulpwood logging operations at the comparatively high levels prevailing during 1944; (2) maintenance of the flow of waste paper to mills at the recent levels of 600,000 tons a month, and (3) how soon the European conflict ends."

Pulpwood

Pulpwood receipts for November aggregated 1,082,500 cords, of which 107,700 cords were imported. This is a 1% decline below November, 1943. The November 1944 decline in domestic wood was 3% below November, 1943. Receipts in the Northeast were 33% higher than in November, 1943; receipts in the South 5% below; while receipts in the Lake States totaled 110,000 cords, or slightly more than in 1943. November receipts of 191,500 cords in the Pacific Northwest, indicates a 13% decline below November, 1943. Receipts in the Appalachian region amounted to 107,400 cords, a decline of about 8% in November, 1944, below November, 1943.

Wood Pulp

Wood pulp allocations for the first 1945 quarter indicate only slight increases above the last 1944 quarter on most types of paper Some 4,000 more tons of pulp is allocated for rayon, celophane and plastics, and more pulp is earmarked for the manufacture of explosives.

Rags

Demand for papermaking rags continues active. The market for new white cuttings is very firm, as supplies are becoming more limited as less goods for civilian uses are being manufactured. Prices are firm at ceiling levels.

Demand for old cotton rags is only fair at this date. Roofing mill inventories are reported as excellent, which may account for the limited buying of the roofing grades at this time. Prices are at ceiling levels.

Old Rope and Bagging

No important change has been reported this week in the old rope market. Prices are firm at ceiling levels.

Little if any improvement in activity has been reported in the old bagging market at this date. Buying continues limited in volume. Prices are soft and continue nominal.

Old Waste Paper

Mill demand for paper stock is urgent. Collections are good but a substantial increase in the current salvage tonnage should be realized, as the potential percentage is around 70% and present collections are well below that figure. However, with increased shipments and paper and paper board overseas, the total volume of collectable waste paper is that much reduced.

Prices on all grades of paper stock are very firm at ceiling levels.

Twine

The twine market is seasonally more quiet at this date. Prices are firm. No important change has been reported in twine and cordage during the current week.

Peruvian Paper Imports Increase

Peruvian imports of paper and paper products during the first six months of 1944 were valued at 9,452,000 soles, an increase of 34 percent over the average value of similar imports in corresponding months of 1943 and 1942, says a report received at the Department of Commerce. On the other hand, exports of wrapping paper during the January-June period of 1944 dropped sharply, totaling only 383 metric tons valued at 433,000 soles; a decrease of 28 percent in volume and 40 percent in value from the average for the same periods of 1943 and 1942.

"NON-USERS ARE THE LOSERS"

PROFIT PRODUCERS

TENAX FELTS

ON THE PRODUCTION FRONT

TENAX FELTS carry on valiantly, backed by over a half-century's intensive training for today's wartime test of service. Record-making economy, and longest life are inherent TENAX features, vital now in great quotas and long runs of paper and fibre. Turn to TENAX FELTS now!

"Non-Users Are The Losers"

LOCKPORT FELT COMPANY
Newfane, N. Y. — U. S. A.

PENNOTEX OIL CORPORATION
29 Broadway
New York, N. Y.

AMORPHOUS WAXES
Melting Points 120° F. to 205° F.

For the Manufacture of

LAMINATING PAPER . . GLASSINES . . WATER-PROOFING . . GREASE PROOFING . . EXTENDERS FOR PARAFFIN, FOOD CONTAINERS, CONTAINER LININGS, ADHESIVENESS AND PROTECTIVE COATING.

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Mfrs. of Engraved Embossing Rollers and Plates of Any Type and Description
Worn Rollers Re-Engraved.

Complete Designing and Engineering Service

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UNIFORM • SUPERIOR • DEPENDABLE

English China Clays Sales Corporation
551 Fifth Avenue, New York City

MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL,
Wednesday, January 10, 1945.

BLANC FIXE—Quotations on blanc fixe continue unchanged. Demand is reported moderate. The pulp is currently quoted at $40 per ton, in barrels, at works; the powder is quoted at $60 per ton, f.o.b. works.

BLEACHING POWDER—Current demand is heavy. Supply situation is reported very good at this date. Quotations continue unchanged. Prices on bleaching powder range from $2.50 to $3.10 per 100 pounds, in drums, car lots, at works.

CASEIN—OPA maximum prices on processed acid-precipitated casein are as follows: 10,000 pounds or more, 24 cents per pound; 2,000 pounds, 24¼ cents per pound; less than 2,000 pounds, 24¾ cents per pound, f.o.b. shipping point.

CAUSTIC SODA—Demand continues very heavy. Production high but supply is still inadequate. Market is tight. Solid caustic soda is quoted at $2.30 per 100 pounds; flaked and ground is quoted at $2.70 per 100 pounds; all in drums, car lots, at works.

CHINA CLAY—Quotations on china clay are unchanged. Current demand is reported fair. Domestic filler clay is currently quoted at from $7.50 to $15 per ton; coating clay is quoted at from $12 to $22 per ton, at mine. Imported clay is quoted at from $13 to $25 per long ton, ship side.

CHLORINE—Demand reported heavy with essential requirements met. Production continues at very high level. Quotations are unchanged. Chlorine is currently quoted at $1.75 per 100 pounds, in single unit tank cars, f.o.b. works.

ROSIN—The rosin market reports prices unchanged on most grades this week. "G" gum rosin is currently quoted at $5.79 per 100 pounds, in barrels, at Savannah. "FF" rosin is currently quoted at $5.75 per 100 pounds, in barrels, at New York. Seventy per cent gum rosin size is currently quoted at $6.06 per 100 pounds, f.o.b. works.

SALT CAKE—Prices on salt cake are reported unchanged for the current week. Consumption is reported moderate for the week. Domestic salt cake is quoted at $15 per ton, in bulk. Chrome salt cake is quoted at $16 per ton. All prices in car lots, f.o.b. shipping point.

SODA ASH—Heavy demand continues for all-over requirements and market is firm. Shipments in bulk prompt; delivery in bagged lots delayed. Quotations continue unchanged. Current prices, car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Current corn receipts higher. Prices reported less firm this week. Starch prices continue unchanged. The pearl grade is quoted at $3.72 per 100 pounds; powdered starch at $3.83 per 100 pounds; all prices in bags, car lots f.o.b. Chicago.

SULPHATE OF ALUMINA—Demand reported good. Quotations continue unchanged. The commercial grades are quoted at from $1.15 to $1.25 per 100 pounds, in bags, car lots, f.o.b. works. The iron free is currently quoted at $1.85 per 100 pounds, in bags, at works.

SULPHUR—Quotations on sulphur continue to conform to prevailing market prices. Demand active. Annual contracts are quoted at $16 per long ton, f.o.b. mines; the price at Gulf Ports is $17.50 per long ton.

TALC—Prices on talc continue unchanged. Demand good. Domestic grades are currently quoted at from $16 to $21 per ton at mines; Canadian at $24 per ton. All prices in car lots.

MARKET QUOTATIONS

All market quotations, excepting those otherwise designated as official OPA maximum prices, are based on the manufacturers' price level as of October 1-15, 1941; maximum wholesale prices are based on the merchants' maximum prices for stipulated quantities at a quoted price to all customers of a like class, as shown by the merchant's sales records of goods delivered during March, 1942. A merchant's price list in effect in March 1942, showing quotations of actual shipments, will establish the current maximum prices.

Paper

(Delivered New York)

Standard News, per ton—			
Roll, contract	*$58.00	@	—
Sheets	66.00	"	—
* OPA Maximum Price.			
Kraft—per cwt.—Carload Quantities Zone A, f.o.b. Mill			
Superstandard Wrapping	*$5.25	@	—
No. 1 Wrapping	*5.00	"	—
Standard Wrapping	*4.75	"	—
Standard Bag	*4.375	"	—
* OPA Manufacturers' Prices.			
Tissues—Per Ream—Carlots			
White No. 1	1.12½	"	—
White No. 1 M. G.	1.10	"	—
White No. 1½	1.00	"	—
White No. 2	.90	"	—
Anti-Tarnish M.F.	1.20	"	—
Colored	—	"	—
Kraft	.95	"	—
Manila	.90	"	—
Toilet—1 M. Sheets—Per Case			
Unbleached	4.25	"	—
Bleached	5.70	"	—
Unbl. Toilet, 1 M.	4.16	"	—
Bleached Toilet	5.70	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	2.20	"	—
Bleached, Jr.	3.20	"	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	11.25	@	—
No. 1 Manila Wrapping, 35 lb.	6.00	"	6.25
No. 2 Manila Wrapping, 35 lb.	5.75	"	6.00
Boards, per ton—			
News	*48.00	@	—
Chip	*48.00	"	—
Sgl. Mla. Lt. Chip	*60.00	"	—
White Pat. Coated	*75.00	"	—
Kraft Liners 50 lb.	*63.00	"	—
Binders Boards	84.00	"	116.00

* OPA Base Prices per 10 tons. Less than 10 tons but over 3 tons, add $2.50; three tons or less, add $5; regular 35-39 basis, add $5.; basis 40-49, add $2.50; basis 91-100, add $2.50; basis 101-120, add $5.

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items. Delivered in Zone 1:

	Bonds		Ledgers	
100% Rag Ext. No. 1	$39.10	@ $46.00	$40.25	@ $47.25
100% Rag	32.20 "	37.75	33.35 "	39.25
85% Rag	.... "	....	29.90 "	35.00
75% Rag	23.00 "	27.00	24.15 "	28.25
65% Rag	.... "	....	22.80 "	27.75
50% Rag	18.70 "	22.75	19.90 "	24.25
25% Rag	16.40 "	20.00	17.55 "	21.50

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items. Delivered in Zone 1:

	Bonds		Ledgers	
No. 1	$10.55	@ $12.75	$11.70	@ $14.25
No. 2	9.65 "	11.75	10.80 "	13.25
No. 3	9.20 "	11.25	10.35 "	12.50
No. 4	8.90 "	10.75	10.05 "	12.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper. Delivered in Zone 1:

No. 1 Glossy Coated	$13.65	@	$15.50
No. 2 Glossy Coated	12.40 "		14.00
No. 3 Glossy Coated	11.60 "		13.25
No. 4 Glossy Coated	11.15 "		12.75
No. 1 Antique (watermarked)	10.25 "		11.75
No. 2 Offset	9.60 "		11.00
A Grade E. F.	9.35 "		10.75
A Grade S. & S. C.	9.60 "		11.00
B Grade E. F.	8.85 "		10.25
B Grade S. C.	9.10 "		10.50
C Grade E. F.	8.55 "		9.75
C Grade S. C.	8.80 "		10.00
D Grade E. F.	8.25 "		9.50
D Grade S. & S. C.	8.50 "		9.75

Ivory & India at $.50 cwt. extra.

Wood Pulp

OPA Maximum Prices and Canadian Manufacturers Prices, Less Freight Not Exceeding OPA Allowances.

Bl. Softwood Sulphite	$86.00
Unbl. Softwood Sulphite	74.00
Bl. Hardwood Sulphite	83.50
Unbl. Hardwood Sulphite	71.50
Bl. Mitscherlich	81.00
Unbl. Mitscherlich ..72.00	@ 82.00
N. Bleached Sulphate	86.00
S. Bleached Sulphate	79.00
N. Semi-Bleached Sulphate	82.00
S. Semi Bleached Sulphate	75.00
N. Unbl. Sulphate	73.00
S. Unbl. Sulphate	63.50
Bl. Soda	72.00
Unbl. Soda	68.00
Groundwood	$0.00

Transportation Allowances

Applying to Producers of Wet Wood Pulp.

	Below 50% Air Dry Weight
Northeast	$13.50
Lake Central	13.50
Southern	16.00
West Coast (in area)	10.50
West Coast (out area)	16.50

	50%-80% Air Dry Weight
Northeast	11.50
Lake Central	11.50
Southern	14.00
West Coast (in area)	9.50
West Coast (out area)	15.50

Applying to Producers of Dry Wood Pulp.

	Above 80% Air Dry Weight
Northeast	$8.50
Lake Central	8.50
Southern	11.00
West Coast (in area)	7.50
West Coast (out area)	13.50

Should freight charges actually exceed these allowances, the difference may be added to the maximum prices.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	6.50	@	7.25*
Silesias No. 1	—	"	5.75*
New Unbleached	6.75	"	7.50*
Blue Overall	—	"	5.50*
Fancy	—	"	3.50*
Washables	—	"	3.00*
Bleached Khaki Cuttings	—	"	4.25*
Unbleached Khaki Cuttings	—	"	3.50*

* OPA Maximum Prices.

We Are Looking for Trouble

Sometimes small things make lots of trouble. Could your machinery be changed a little to save a lot of work? Write and tell us what we can do to help. Or a *Union* representative will be glad to call.

UNION MACHINE COMPANY
FITCHBURG, MASS.
(Associated with Union Screen Plate Company)

LAMINATED PAPERS

HAVE you planned for the unusual demand for this type of product after the war? • Ask about machines for laminating foil, paper, glassine, cellophane and boards. • We build them for pastes, glues, asphalts and waxes. • Can we send complete information? Ask us.

•

HUDSON-SHARP
MACHINE CO • GREEN BAY • WIS

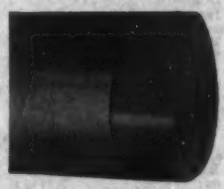
SONOCO CORES
PAPER MILL
FOR RUGGED DUTY

RHINO NON-RETURNABLE

For all uses requiring an extremely tough non-returnable paper mill core.

DURO*–Standard returnable core of plus-standard quality. Shown with Taylor ends. Also available with Bermico ends.

ENDURO*–Very high grade returnable core to meet extra demand for strength. Shown with Bermico ends. Taylor ends available.



*Supply limited, due to shortage of higher grade stock from which these cores are made.

DON'T WASTE PAPER SAVE WASTE PAPER

BERMICO†–A returnable fibre core—extremely hard, strong and rugged. Treated to resist weather and moisture changes.

†Exclusive distributors for Bermico ends, Bermico Fibre Cores.

SONOCO MAKES *EVERYTHING* IN *PAPER CARRIERS*

SONOCO PRODUCTS COMPANY

BRANTFORD ONT · HARTSVILLE S. C. · MYSTIC CONN.

SHIPPING POINTS: LOWELL, MASS. HARTSVILLE, S. C.

DEPENDABLE SOURCE OF SUPPLY

Old Rags

White, No. 1—
Repacked ..... *1.80 "
Miscellaneous .... *1.20 "
White, No. 2—
Repacked ..... *2.90 "
Miscellaneous .... *2.65 "
Third and Blues—
Repacked ..... *2.20 "
Miscellaneous .... *1.80 "
Roofing Rags—
No. 1 ..... *1.85 "
No. 2 ..... *1.45 "
No. 3 (bagging) .. *1.35 "
No. 4 ..... *1.35 "
No. 5A ..... *1.35 "
Old Manila Rope .. 5.75 "
OPA Maximum Prices.

Foreign Rags

All Prices nominal

New Rags

New Dark Cuttings .. 3.25 @ 4.40
New Mixed Cuttings. 2.00 " 2.20
New Light Silesias .. 5.50 " 5.75
Light Flannelettes ... 5.50 " 5.75
New White Cuttings. 7.00 " 7.50
New Light Oxfords. 4.00 " 4.50
New Light Prints ... 3.00 " 3.25

Old Rags

No. 1 White Linens. 7.50 " 8.50
No. 2 White Linens. 6.50 " 7.50
No. 3 White Linens. 4.50 " —
No. 4 White Linens. 2.25 " 3.25
No. 1 White Cotton. 4.25 " 4.75
No. 2 White Cotton. 3.25 " 3.75
No. 3 White Cotton. 2.50 " 3.00
No. 4 White Cotton. 1.90 " 2.20
Extra Light Prints .. 2.00 " 2.40
Ord. Light Prints ... 1.75 " 2.15
Med. Light Prints ... 1.55 " 1.95
Dutch Blue Cottons. 2.25 " 2.50
French Blue Linens. 3.00 " —
Checks and Blues ... 3.00 " —
Linsey Garments .... 1.90 " 2.00
Dark Cottons ..... 1.50 " 1.60
Old Shopperies ..... 1.30 " 1.45
New Shopperies ..... 1.45 " 1.50
French Blues ..... 2.25 " 2.50

BAGGING

(Prices to Mill, f. o. b. N Y.)

Gunny No. 1—
Foreign ..... Nominal
Domestic ..... 4.25 @ 4.35
Wool Tares, light .... 4.25 " 4.50
Wool Tares heavy ... 4.50 " 5.00
Bright Bagging ..... 4.50 " 4.85
Manila Rope—
Foreign ..... — " —
Domestic ..... *5.75 " —
Jute Threads ..... 5.50 " —
No. 1 Sisal Strings .. *4.00 " —
Mixed Strings ..... 2.00 " —
* OPA Maximum Price.

Old Waste Papers

(F. o. b. New York)

OPA Maximum Prices, Baled

No. 1 Hard White Envelope Cuts, one cut ..... 3.37½ @ —
No. 1 Hard White Envelope Cuts .... 3.12½ " —
No. 1 Hard White Shavings, unruled. 2.87½ " —
No. 1 Hard White Shavings, ruled ... 2.50 " —
Soft White Shavings, one cut ..... 2.87½ " —
No. 1 Soft White Shavings ..... 2.50 " —
Soft White Shavings, Misc. ..... 2.15 " —
No. 1 Fly Leaf Shavings ..... 1.67½ " —
No. 2 Fly Leaf Shavings ..... 1.12½ " —
No. 1 Groundwood Fly Leaf Shavings 1.25 " —
No. 2 Mixed Groundwood Fly Leaf Shavings ..... .90 " —
Mixed Colored Shavings ..... .75 " —
Mixed Groundwood Colored Shavings. .90 " —
Overissue Magazines ..... 1.67½ " —
No. 1 Heavy Books & Magazines ..... 1.92½ " —
Mixed Books ..... 1.10 " —
No. 1 White Ledger .. 2.30 " —
No. 2 Mixed Ledger, colored ..... 2.00 " —
New Manila Envelope Cuttings, one cut .. 2.87½ " —
New Manila Envelope Cuttings ..... 2.65 " —
Extra Manillas ..... 1.95 " —
Mixed Kraft, Env. & Bag Cuttings ..... 2.75 " —
Kraft Envelope Cuttings ..... 3.25 " —
Triple Sorted, No. 1 Brown Soft Kraft. 2.50 " —
New 100% Kraft Corrugated Cuttings. 2.25 " —
No. 1 Assorted Old Kraft ..... 1.75 " —
New Jute Corrugated Cuttings ..... .90 " —
Old 100% Kraft Corrugated Containers 1.75 " —
Old Corrugated Containers ..... 1.40 " —
Box Board Cuttings. .72½ " —
White Blank News .. 1.65 " —
Overissue News ..... 1.10 " —
No. 1 News ..... 1.00 " —
No. 1 Mixed Paper ... .95 " —
Old Corrugated Containers ..... .82½ " —
Mill Wrappers ..... 1.10 " —

Twines

All Prices Nominal

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—
India ..... .21 @ —
White Hemp ..... .21 " —
Fine Polished—
Fine India ..... .26 " —
Unpolished—
Box ..... .17½ " —
Paper Makers ..... .17 " —
Tube Rope ..... .19 " —
Wall Paper ..... .20½ " —
Wrapping ..... .23 " —
Soft Fiber Rope ... .19 " —
Cotton ..... .25 " —

(Hard Fiber)

Medium Java ..... .18 " —
Mex. Sisal ..... .16 " —
Manila ..... " —

PHILADELPHIA

Domestic Rags (New)

(Price to Mill)

Shirt Cuttings—
New White No. 1 ..... .07¼
New White No. 2 ..... .05½
Light Silesias ..... .05½
Black Silesias, soft ..... .03½
New Unbleached ..... .07½
Washable Prints ..... .04¼
Washable No. 1 ..... .03
Blue Overall ..... .05½
Cottons—According to grades—
Washable shredding ..... .01¾
Fancy Percales ..... .04¼
New Black Soft ..... .03½
Khaki Cuttings—
Unbleachable Cotton Cuttings .03½
Bleachable Cotton Cuttings .. .04¼
Men's Corduroy ..... .03½
Ladies' Corduroy ..... .03
Cottonades ..... .03¼

Domestic Rags (Old)

White No. 1—Repacked ..... 2.90 " —
Miscellaneous No. 1. 1.80 " —
Miscellaneous No. 2. 2.65 " —
White No. 2—Repacked ..... 2.90 " —
Thirds and Blues—
Miscellaneous .... 1.80 " —
Repacked ..... 2.30 " —
Black Stockings—(Export) ..... Nominal
Roofing Stock—
Foreign No. 1 ....Nominal
Domestic No. 1 ... 1.55 " —
Domestic No. 2 ... 1.45 " —
Roofing Bagging .. 1.35 " —
Old Manila Rope ... 5.75 " —

Bagging

(F. o. b. Phila.)

Gunny No. 1—
Foreign ..... Nominal
Domestic ..... 1.00 " 4.50
No. 1 Clean bright—
Sisal Strings ..... .04
No. 2 Clean bright—
Sisal Strings ..... .03
Sisal Jute ..... .02½ " .03½
Scrap—
No. 1 ..... 1.25 " 2.10
No. 2 ..... 1.75 " 1.80
Wool Tares hvy .. 4.00 " 4.75
No. 1 New Light Burlap ..... 3.00 " 4.00
New Burlap Cuttings 1.75 " 4.00

Old Papers

(F. o. b. Phila)

OPA Maximum Prices, Baled

No. 1 Hard White Envelope Cuts, one cut ..... 3.37½ " —
No. 1 Hard White Shavings, unruled .. 2.87½ " —
Soft White Shavings, one cut ..... 2.50 " —
White Blank News .. 1.65 " —
Soft White Shavings ..... 2.15 " —
No. 1 Fly Leaf Shavings ..... 1.67½ " —
No. 2 Fly Leaf Shavings ..... 1.12½ " —
No. 1 Groundwood Fly Leaf Shavings 1.25 " —
No. 2 Groundwood Fly Leaf Shavings .90 " —
Mixed Colored Shavings ..... .75 " —
New Manila Envelope Cuts, one cut ..... 2.87½ " —
Hard White Envelope Cuts, one cut ..... 3.37½ " —
Triple Sorted No. 1 Brown Soft Kraft. 2.50 " —
Mixed Kraft Env. & Bag Cuttings ..... 2.75 " —
Kraft Envelope Cuttings ..... 3.25 " —
No. 1 Heavy Books & Magazines ..... 1.92½ " —
New Manila Envelope Cuts, one cut ..... 2.87½ " —
New Manila Envelope Cuttings ..... 2.65 " —
White and Colored Tabulating Cards .. 2.25 " —
Ground Wood Tabulating Cards ..... 1.35 " —
White Blank News .. 1.65 " —
No. 1 Assorted Old Kraft ..... 1.75 " —
No. 1 Mixed Paper ... .95 " —
Overissue News ..... 1.10 " —
Box Board Cuttings. .72½ " —
New Corrugated Cuttings, Kraft ..... 2.25 " —
Old 100% Kraft Corrugated Containers 1.75 " —
Old Corrugated Containers ..... 1.40 " —
Jute Corrugated Cuttings ..... 1.07½ " —

Bagging

(F. o. b. Boston)

Gunny Bagging—
Foreign ..... (nominal)
Domestic ..... — @ 2.50
Sisal Rope No. 1 .... *4.75 " —
Sisal Rope No. 2 .... *4.25 " —
Mixed Rope ..... — " 1.55
Transmission Rope—
Foreign ..... (nominal)
Domestic ..... 2.75 " 3.00
Manila Rope—
Foreign ..... (nominal)
Domestic ..... 5.75 " —
Soft Jute Rope ..... 5.25 " —
Jute Car Threads. 3.00 " 3.50
Bleachery Burlap .... 8.50 " 9.00
Scrap Burlap—
Foreign ..... (nominal)
Domestic ..... — " 2.75
South American ... — " 3.00

BOSTON

Old Papers

(F. o. b. Boston)

OPA Maximum Prices, Baled

No. 1 Hard White Shavings, unruled. 2.87½ @ —
No. 1 Hard White Shavings, ruled ... 2.50 " —
Soft White Shavings, Misc. ..... 2.15 " —
No. 1 Fly Leaf Shavings ..... 1.67½ " —
No. 2 Fly Leaf Shavings ..... 1.12½ " —
No. 1 Groundwood Fly Leaf Shavings 1.25 " —
No. 2 Groundwood Fly Leaf Shavings .90 " —
Mixed Colored Shavings ..... .75 " —
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Box Board Cuttings. .72½ " —
New Corrugated Cuttings, Kraft ..... 2.25 " —
Old 100% Kraft Corrugated Containers 1.75 " —
Old Corrugated Containers ..... 1.40 " —
Jute Corrugated Cuttings ..... 1.07½ " —

Bagging

(F. o. b. Boston)

Gunny Bagging—
Foreign ..... (nominal)
Domestic ..... — @ 2.50
Sisal Rope No. 1 .... *4.75 " —
Sisal Rope No. 2 .... *4.25 " —
Mixed Rope ..... — " 1.55
Transmission Rope—
Foreign ..... (nominal)
Domestic ..... 2.75 " 3.00
Manila Rope—
Foreign ..... (nominal)
Domestic ..... 5.75 " —
Soft Jute Rope ..... 5.25 " —
Jute Car Threads. 3.00 " 3.50
Bleachery Burlap .... 8.50 " 9.00
Scrap Burlap—
Foreign ..... (nominal)
Domestic ..... — " 2.75
South American ... — " 3.00

Miscellaneous

No. 1 White Ledger .. 2.30 " —
No. 2 Ledger, colored 2.00 " —
No. 1 Heavy Books & Magazines ..... 1.92½ " —
Overissue Magazines. 1.67½ " —
New Manila Envelope Cuttings ..... 2.65 " —
No. 1 Assorted Old Kraft ..... 1.75 " —
No. 1 Mixed Paper ... .95 " —
Box Board Cuttings. .72½ " —
Kraft Corrugated Cuttings ..... 2.25 " —
Old Corrugated Containers ..... 1.40 " —
Overissue News ..... 1.00 " —
No. 1 News 1.00

Wool Tares—

Foreign ..... (nominal)
Domestic 4.25
Aust. Wool Pouches .. — " 3.00
New Zealand Wool Pouches ..... — " 3.50
New Burlap Cuttings 4.75 " 5.00
Heavy Baling Bagging 4.00 " 4.25
Paper Mill Bagging . 2.50 " 3.00
No. 2 Roofing Bagging 1.35 " —
* OPA Maximum Price

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—
New Light Prints .04½ @ 04½
Fancy Percales .... 04¼ " 04
New White No 1 .06¾ " 07
New Light Flannelettes ..... 05½ " 06
Canton Flannels—
Bleached ..... 08 " 08½
Underwear Cutters, Bleached ..... 06¾ " 07½
Underwear Cutters, Unbleached ..... 05¾ " 06
Silesias No. 1 ..... 06 " 06½
New Black Silesias .. 03 " 03½
Red Cotton Cuttings 03½ " 04
Soft Unbleached ... 06½ " 06½
Blue Cheviots .... 05½ " 06
Fancy ..... 02¾ " —
Washable ..... 02¾ " —
Khaki Cuttings .... 02¾ " 03
O. D. Khaki ..... 03¼ " 03½
Corduroy ..... 03¾ " 03½
New Canvas ..... 06¼ " 06½
B. V. D. Cuttings ... 06¼ " 06½

Domestic Rags (Old)

(F. o. b. Boston)

White No. 1—
Repacked ..... 3.80 @ —
Miscellaneous .... 3.20 " —
White No. 2—
Miscellaneous .... 2.65 " —
Twos and Blues, Repacked ..... 2.20 " —
Old Blue Overalls ... 2.25 " 2.50
Thirds and Blues, Repacked ..... 2.20 " —
Miscellaneous ..... 1.80 " —
Black Stockings .... 3.50 " 4.00
Roofing Stock—
No. 1 ..... 1.55 " —
No. 2 ..... 1.45 " —
No. 3 ..... 1.35 " —
No. 4 ..... 1.35 " —
No. 5, Quality A .. 1.35 " —
Quality B .. 1.20 " —
Quality C .. .95 " —
* Old Manila Rope .. 5.75 " —
* OPA Maximum Prices.

Foreign Rags

(F. o. b Boston)

Canvas ..... (nominal)
Dark Cottons ..... (nominal)
Dutch Blues ..... (nominal)
New Checks and Blues .. (nominal)
Old Fustians ..... (nominal)
Old Linsey Garments .. (nominal)
New Silesias ..... (nominal)

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Waste Paper

(F. o. b. Chicago)

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Shavings—
No. 1 Hard White Envelope Cuts, one cut ..... 1.37½ " —
No. 1 Hard White Shavings, unruled. 2.87½ " —
No. 1 Soft White Shavings ..... 2.50 " —
No. 1 White Ledger .. 2.30 " —
No. 1 Heavy Books & Magazines ..... 1.92½ " —
White Blank News .. 1.65 " —
Mixed Kraft Env. & Bag Cuttings ... 2.75 " —
No. 1 Assorted Old Kraft ..... 1.75 " —
Overissue News ..... 1.10 " —
No. 1 News ..... 1.00 " —
No. 1 Mixed Paper ... .95 " —
No. 1 Roofing Rags. 1.55 " —
No. 1 Roofing Bags. 1.45 " —

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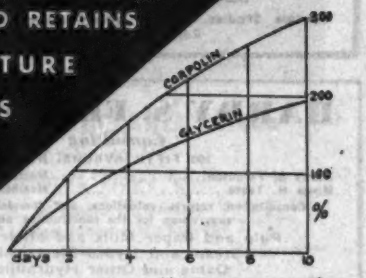

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Time study and industrial engineers
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Graduate in paper technology; or chemist or chemical engineer with pulp and paper experience. Location western New York. Work includes original research on pulp and paper problems, development work in laboratory and field, and some travel. Address Box 45-23, care Paper Trade Journal. J-18

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ENGINEERS and DRAFTSMEN experienced in pulp and paper mill design and process by Consulting Engineers. Address Box 44-809 care Paper Trade Journal. T.F.

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PAPER CHEMIST—Graduate paper chemist with some plant experience, for research, development and sales service work with well known chemical product. Location in Pennsylvania. State age, experience and salary desired. Confidential. Address Box 44-861 care Paper Trade Journal. J-11

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WANTED—Export Manager for paper export house. An attractive position for the right man. Address Box 45-20 care Paper Trade Journal. J-18

WANTED—Paper Mill Mechanic for maintenance and repair work. Permanent position. Acme Paper Board Company, Reading, Penna. J-11

SITUATIONS WANTED

WANTED—Position as Production Engineer. Would consider group of mills. Excellent reputation and references. Address Box 44-831 care Paper Trade Journal. J-11

WANTED — Position as Operation Manager board mill. Full knowledge mfg. and converting. References. Address Box 44-832 care Paper Trade Journal. J-11

WANTED—Full charge of one machine board mill. Have complete requirements. What do you offer? Confidential all replies. Address Box 44-833 care Paper Trade Journal. J-11

WANTED—Position as Plant Engineer. Twenty years practical and technical experience in Paper Mills. Replies confidential. Address Box 44-834 care Paper Trade Journal. J-11

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1—Thickener—72" face x 36" diameter Cylinder Mold — including couch roll.

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Various sizes of Centrifugal Pumps. Write us regarding your particular requirements.

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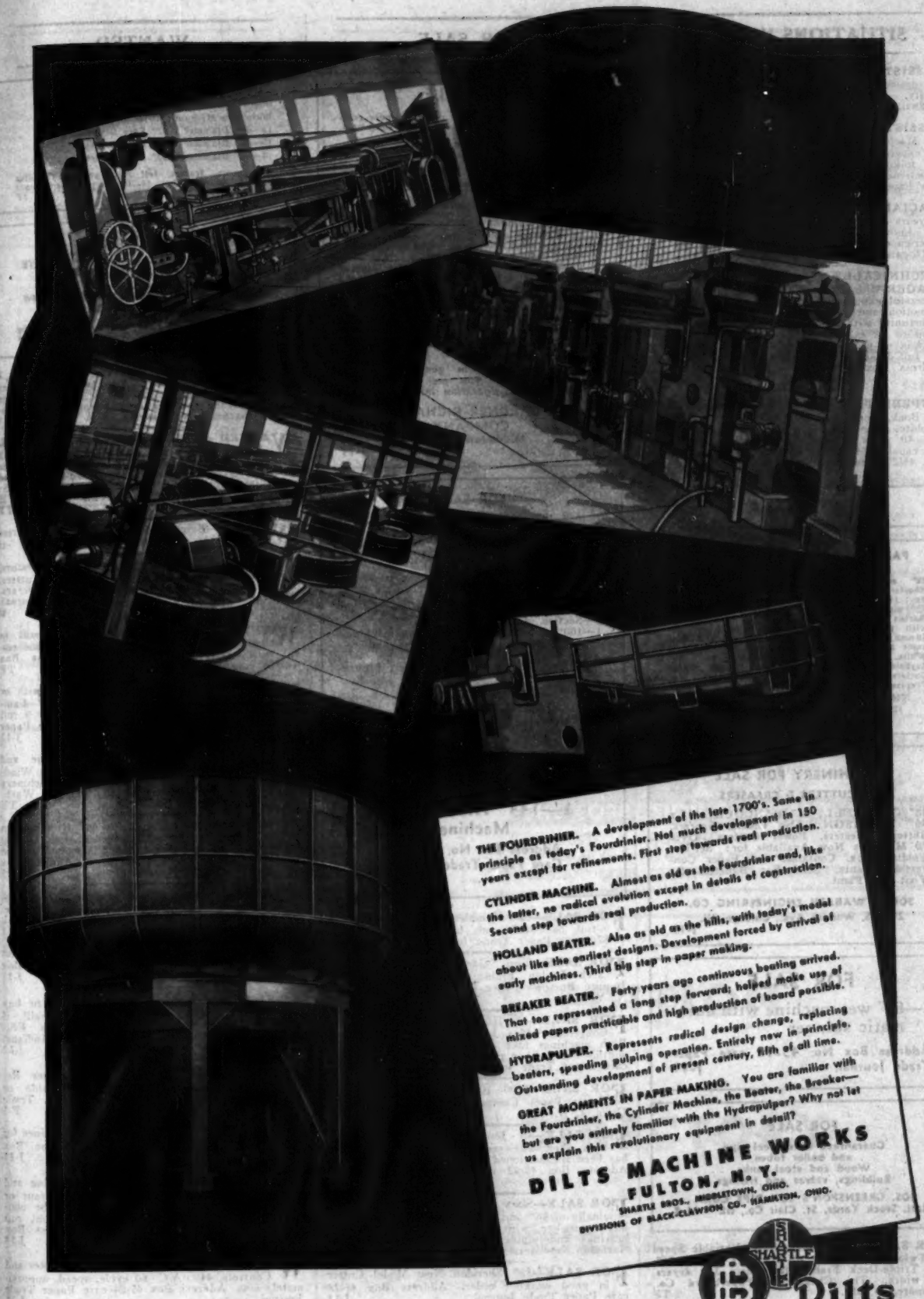

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50" and 43" Hamblet single Knife Rotary Sheeters; 60" Clark Sheeter with automatic layboy; 110" Hamblet extra heavy mill type Sheeter; 72" six-roll double deck Back-Stand; 60" Rice-Barton Slitter & Rewinder for use in connection with paper making machine; SLITTERS: 50" Inman, 50" Langston, 42" Kidder, 48" S & S.—same as new, 62" Columbian and 60" Moore & White, 46 x 66 Robinson Double Scorer; 44" Seybold and White Automatic Power Paper Cutters; Kidder one and two-color Rotary Web Presses.

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68" COTTRELL; 65" BABCOCK; 32" x 46" THOMSON. Also Gluers, Scorers, Slitters, Sheeters, Power Cutters. Over 70 Machines Now Available for: Set-Up, Folding Box, Container and Paper Converting Plants. Send For Bulletins Or Visit Our Plant.

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1—84" wet machine with automatic skinner

Address Box No. 45-12 care Paper Trade Journal. J-11

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FOR SALE

FOR SALE

One Moore and White, four drum rewinder complete with driving motors and control equipment.

Separate slitting equipment

126"—Trim
50"—Diameter of rolls
6 —Number of rolls
18"—Diameter of winding drum roll
0"—1000' F.P.M.
4" & 3"—Expansion winding shafts

Control Equipment

1—60 H.P. 440 volts, 3 phase, 60 cycle, Westinghouse hand operated, reduced voltage starter for motor generator set.

1—Reliance electric, motor generator set mounted on common base consisting of, 1—60 H.P., 440 volts 60 cycle, 3 phase, 1800 R.P.M. A.C. motor. 1—40 K.W., 230 volts D.C., Generator, 1 Exciter, 3 K.W. 230 volts D.C.

4—Reliance electric motors 230 volts D.C. driving winder drum rolls.

1—Reliance electric motor 230 volts D.C. driving slitters.

This equipment is in good mechanical condition, and if you are interested, it can be seen in operation in our mill.

THE GARDNER-RICHARDSON COMPANY
Middletown, Ohio.
J-11

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1—43" Heavy duty Dornbusch Embosser, anti friction equipped, rebuilt.
1—Ingersoll Rand 15" x 15" x 16" Class B1, single stage, type 10 Twin Air Compressor, belt driven.
1—Iron work for one Noble & Wood 62" x 48" beater, spare bedplate and new woods for same.
1—Section of 21 dryers 36" x 74".
1—Section of 20 dryers 36" x 84".
1—100" Shartle & Bevis waxing machine.
1—114" Beloit two drum slitter and rewinder.
1—60" x 60" Horne patent beater, bronze bars, 4" tub.
4—1000 lb. Umpherston Beaters.

FRANK H. DAVIS CO.
175 Richdale Ave., Cambridge 40, Mass. J-25

FOR SALE

1—144" Trim Cylinder Machine

Address Box No. 44-877
Care Paper Trade Journal
J-11

FOR SALE—65" Hamblet single knife Sheeter, 6-roll back-stand, no layboy. Address Box 44-876 care Paper Trade Journal. J-18

FOR SALE—Two Noble and Wood Pony Monarch Jordan Fillings, Shartle Manufacture. Inquire Burrows Paper Corporation, Little Falls, N. Y. J-18

FOR SALE—1 - Hudson Sharp #20B Toilet Converter. Also 1 similar Dietz equipment. Both machines take a jumbo roll up to 81" in width. For further particulars address Box 45-16 care Paper Trade Journal. J-11

FOR SALE—1000 - 10" diameter metal plugs. Foster Paper Company, Inc., 2160 Erie St., Utica, 4, N. Y. J-18

FOR SALE—1 - Jones Majestic Jordan — Cast Iron Shell with steel filling in plug. Jordan has been reconditioned and is in very good shape. Address Box 45-22 care Paper Trade Journal. J-18

FOR SALE—Sixty (60) Dryers consisting principally of 86" and 90" face, a few 84" and 85" face, complete with triple deck stands, gears, bearings and piping. Empire Box Corporation, Garfield, New Jersey. F-15

FOR SALE—50" Sheridan New Model Cutter in good working order. Address Box 45-28 care Paper Trade Journal. J-11

WANTED

WANTED

One (1) Laboratory Beater
Waterbury Hydraulic Drive size 5
11—60" Diameter x 82" Face Dryers
16—48" Diameter x 82" Face Dryers
4—36" Diameter x 82" Face Dryers

with gears, frames, felt rolls and cone pulley drives. Address Box 44-708 care Paper Trade Journal. TF

WANTED

CALENDER STOCK—10" INTERMEDIATE ROLL MINIMUM
ALSO
SHEETER—SINGLE OR DOUBLE CUT-OFF BOTH FOR 72" MACHINE

Address Box 44-728 care Paper Trade Journal. TF

WANTED—Two (2) Jordans—No. 1 or No. 2 Miami or equivalent. Also, two (2) Calender Stacks approximately 100" face. Give complete description and specifications. Empire Box Corporation, Garfield, New Jersey. J-11

WANTED — DISCARDED PAPER MILL FELTS. HIGHEST PRICES paid for all kinds of discarded paper mill felts. LARGE or SMALL QUANTITIES accepted. Prices quoted immediately on receipt of samples. ADDRESS: GLASER AND YOFFE, INC., 80 NORTH MAIN ST., NATICK, MASS. TF

WANTED—Brightwood Box Machine. Address Box 44-836 care Paper Trade Journal. tf

WANTED—W & P Shredders, Evaporators, Generators and Boilers, Slitters, Cutters, Hydraulic Presses, Sheridan Presses, Dryers. Address Box 44-835 care Paper Trade Journal. tf

WANTED TO PURCHASE—Paper mill in operation. Can pay all cash. Large successful mill preferred. Confidential. Address Box 44-770 care Paper Trade Journal. TF

WANTED—1 - #2 Miami Jordan Plug with or without shaft; 1 - Cylinder Mould 60" diameter, 60" face; 1 - Finishing Calender 7 or 9 roll 60" to 66" face. Address Box 44-868 care Paper Trade Journal. J-11

WANTED—Any Item of Paper Tube and Paper Can Machinery, Slitters, Tube Winders, Cutters, etc. etc. We will buy such machinery in any condition. Theo. Adams, 111 W. Washington St., Chicago, 2, Ill. TF

WANTED—One 56" and one 64" trim modern Cameron or Langston winder with slitting attachment just before the paper is wound on the roll. Give full description and price. Address Box 45-5 care Paper Trade Journal. J-25

WANTED — Paper Slitter 40 to 45 inches. Especially interested in a Beck Machine. Address Box 45-26 care Paper Trade Journal. J-11

WANTED—Automatic Layboy for rotary sheet cutter from 60" to 72" wide. Address Box 45-25 care Paper Trade Journal. J-11

EFFICIENCY ENGINEERS—Wanted to buy — cash — successful operating papermill. If management will remain and work with us. Efficiency Engineers, Cambridge City, 19, Indiana. J-11

WANTED—Embossing Calender. Slitter Rewinder. Both heavy duty—50" wide or wider. Address Box 45-17 care Paper Trade Journal. F-1

WANTED—Paper Bag Packaging Machines for packaging 500 paper bags. Address Box 45-21 care Paper Trade Journal. J-11

WANTED—Hot Melt Coating, Combining and Laminating equipment. Complete layout or component elements or items that may be converted to such use. Prefer 60" width, but can use somewhat wider or narrower. Address Box 45-18 care Paper Trade Journal. J-18

WANTED—75 H. P. Variable Speed Motor and Controls, 440 - A.C - 60 cycle, speed, approximately 600. Address Box 45-24 care Paper Trade Journal. J-11

WANTED

WANTED TO BUY (Not a dealer)—Complete plant (without buildings and property) for coating and laminating cotton cloth and paper with resins, pigments, glues, asphalt, waxes, lacquers, latex, etc.—or—Individual machines to fit into complete installation. Can take over capable personnel. Address Box 45-19 care Paper Trade Journal. J-18

BUSINESS OPPORTUNITY

Enterprising London paper agents, having closest connections with leading paper merchants, importers and converters in Great Britain, the Colonies and the European Continent, desire to contact U. S. mills and exporters with a view to representation.

Address Box 44-815 care Paper Trade Journal. J-11

WANTED TO HEAR from parties interested in purchasing interest or control in large very successful pulp and paper mill. Confidential. Address Box 45-9 care Paper Trade Journal. J-11

SALES AGENCY

A serious French company is looking to make contact to act as sales representative in France for manufacturers of newsprint, wrapping and printing papers.

If you are interested in post war export business to France, please get in touch with Box 44-875 care Paper Trade Journal. J-11

FOR SALE

FOR SALE

FOR SALE

One complete 98" Fourdrinier and auxiliaries, specifications as follows:—

1—Moore & White Co. 98" Fourdrinier Paper Machine (Wire 70' Long x 98" Wide).
3—Sets of Presses.
1—18" Diameter Suction Couch Roll (Sandusky).
1—150 H.P. General Electric Co. motor and starter, driving the wet end of this machine.
20—Dryers—42" Diameter x 98" Face (2 deck).
1—Baby Dryer—30" Diameter x 98" Face.
1—Bottom Felt Dryer—30" Diameter x 98" Face.
1—Top Felt Dryer—30" Diameter x 98" Face.
1—4-Roll Calender Stack.
1—2-Reel Reel.
1—2-Drum Moore & White Co. Slitter and Winder.
7—1000 lb. Beaters (Noble and Wood Machine Co.).
1—200 H.P. motor and starter (3 phase, 60 cycles, 440 volts), driving line shaft for these beaters.
1—Motor driven Mammoth, Jr. Jordan (Noble and Wood Machine Co.).
2—10-plate Sandy Hill Flat Screens (Pusher type), Witham Fasteners.
3—Sets of spare screen plates for the above Flat Screens.
1—Ames Twin Variable Speed Engine, from 80 to 200 H.P.
1—New bottom dryer felt—72 yards long x 98" wide.
1—New top dryer felt—78 yards long x 98" wide.
7—New Wet End felts—42' long x 100" wide.
1—New Fourdrinier Wire—70' long x 98" wide (80 mesh).

In addition to the above, we have available all the line shafting, piping, spare rolls, drives, stock chests, agitators, etc.
The above described machine is in excellent condition, having been in operation approximately three years on experimental work—presently on original foundations and can be seen in actual operation. Photos on request.

J. J. ROSS COMPANY, 250 Frelinghuysen Avenue, Newark 5, N. J. J-11

The right man may be seeking a job in an advertisement in this section.

The machine or the material you urgently need may be advertised right here in these columns. Read Them, Use Them—If you need something, advertise for it—If you have something to sell tell the industry about it—Everybody reads the Clearing House.

TECHNICAL BOOKS AVAILABLE

BIBLIOGRAPHY OF PAPERMAKING, Vol. 1 1900-1928 — $10.00

PAPER MAKING MATERIALS (Reading List) By Clarence J. West, Ph.D. — $3.00

LOCKWOOD TRADE JOURNAL CO., Inc.
15 W. 47th St., N. Y. C.

MISCO "C"

THE CORROSION RESISTANT ALLOY

CAST • ROLLED • FABRICATED

for all equipment exposed to corrosion by sulphite acids

MICHIGAN STEEL CASTING CO., DETROIT 7, MICH.

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LOCKWOOD TRADE JOURNAL CO. INC.

WHERE TO BUY

ABRASIVES
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Monsanto Chemical Co.
Norton Co.

ADHESIVES
Arabol Mfg. Co.
National Adhesives Division of National Starch Products, Inc.
Philadelphia Quartz Co.
Swift, Hall & Co., Inc.
United States Rubber Co.

AGITATORS
Appleton Machine Co.
Dilts Machine Works, Inc.
Dorr Company
Downingtown Mfg. Co.
Improved Paper Machy. Corp.
E. D. Jones & Sons Co.
D. J. Murray Mfg. Co.
Montague Machine Co.
Moore & White Co.
Noble & Wood Machine Co.
The Norwood Engineering Company
H. K. Porter Company Inc.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

BAG MACHINES
Thomas W. Hall Co., Inc.
Pendevin Machine Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Weber, Herman G.

BARKERS AND CHIPPERS
Allis-Chalmers Mfg. Co.
Appleton Machine Co.
Carthage Machine Co.
D. J. Murray Mfg. Co.
Valley Iron Works Co.

BARS
Dilts Machine Works, Inc.
E. D. Jones & Sons Co.
The Moore & White Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.
Simonds Worden White Co.
Valley Iron Works Co.

BEARINGS
Bantam Bearings Division, The Torrington Company
Black-Clawson Company
Jones, E. D. & Sons Co.
The Manhattan Rubber Mfg. Co.
Montague Machine Works
Rollway Bearing Co.
Shartle Brothers Machine Co.
Shenango-Penn Mold Co.
Timken Roller Bearing Co.
Valley Iron Works Co.
T. B. Woods' Sons Company

BEATERS & JORDANS
The Appleton Machine Co.
Black-Clawson Company
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
Herman Mfg. Co.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
J. J. Ross Company
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works

BED PLATES
Bahr Brothers Mfg. Co.
Dilts Machine Works Inc.
Downingtown Mfg. Co.
Farrel-Birmingham Co., Inc.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.
Simonds Worden White Co.
Valley Iron Works Co.

BELTING
Allis-Chalmers Mfg. Co.
The Cincinnati Rubber Mfg. Co.
The Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc.
J. E. Rhoads & Sons
United States Rubber Co.
T. B. Wood's Sons Company
Worthington Pump & Machinery Corp.

BLEACHING APPARATUS
Improved Paper Machy. Corp.
E. D. Jones & Sons Co.
Perkins & Sons, Inc., B. F.
Moore & White Co.
Niagara Alkali Co.
Noble & Wood Machine Co.
Pennsylvania Salt Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

BLOW PIPES & PITS
Montague Machine Co.
Moore & White Co.
Murray Mfg. Co., D. J.
Walworth Company
Valley Iron Works Co.

BOTTOMS
Harrington & King Perforating Co.
Kalamazoo Tank & Silo Co.

CALENDERS
Black-Clawson Company
Downingtown Mfg. Co.
Farrel-Birmingham Co., Inc.
Lobdell Car Wheel Co.
Moore & White Co.
Perkins & Son, Inc., B. F.
The Norwood Engineering Company
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works
Waldron Corp., John

CASTINGS
Appleton Machine Co.
Black-Clawson Company
Dilts Machine Works
Downingtown Mfg. Co.
Farrel-Birmingham Co.
The Frederick Iron & Steel Co.
Grinnel Company
Hamblet Machine Co.
E. D. Jones & Sons Co.
Lobdell Car Wheel Co.
Montague Machine Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Shenango-Penn Mold Co.
Smith & Winchester Mfg. Co.
Traylor Engineering & Mfg. Co.
Union Machine Company
Union Screen Plate Co.
Valley Iron Works Co.
Walworth Company

CENTRIFUGAL MACHINERY
Bird Machine Co.
De Laval Steam Turbine Co.
Nichols Engrg. & Research Corp.
Ross J. O. Eng. Co.
Shartle Brothers Machine Co.

CHEMICALS
Aktivin Corporation
Amer. Cyanamid & Chem. Corp.
Ansul Chemical Co.
Calco Chemical Co.
Diamond Alkali o.
Dispersion Process Inc.
Dow Chemical Company
E. I. du Pont de Nemours & Co., Inc.
General Dyestuff Corp.
Geigy Co., Inc.
Goetzmann & Co.
Hooker Electrochemical Company
The Mathieson Alkali Works, Inc.
Monsanto Chemical Company
The Neville Company
National Oil Products Co.
Naugatuck Chemical Div. of U. S. Rubber Co.
Niagara Alkali Company
Paper Makers Chemical Department, Hercules Powder Co.
Pennsylvania Salt Mfg. Co.
Pittsburgh Plate Glass Co., Columbia Chemical Division
Solvay Sales Corp.
Stauffer Chemical Company
United States Rubber Co.
Witco Chemical Co.
Wyandotte Chemicals Corp.

CLEANING MATERIALS
Amer. Cyanamid & Chem. Corp.
Bird Machine Co.
E. I. du Pont de Nemours & Co., Inc.
Oakite Products, Inc.
Paper Makers Chemical Department, Hercules Powder Co.
Magnus Chemical Co.
Nichols Engrg. & Research Corp.
Pennsylvania Salt Mfg. Co.
Philadelphia Quartz Co.
Pittsburgh Plate Glass Co., Columbia Chemical Division
Solvay Sales Corp.
Wyandotte Chemicals Corp.
J. B. Ford Division

CLUTCHES
Appleton Machine Co.
Black-Clawson Company
Hudson Sharp Machine Company
Farrel-Birmingham Co.
Fawick Airflex Co., Inc.
Horton Manufacturing Co.
Rodney Hunt Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
Stearns Magnetic Mfg. Co.
Valley Iron Works Co.
T. B. Wood's Sons Company

COATING MACHINERY
Hudson Sharp Machine Company
Moore & White Co.
Pendevin Machine Co.
Rotogravure Engrg. Co.
Shartle Brothers Machine Co.
Waldron Corporation, John
Weber, Herman G.

COMPRESSORS
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
Ingersoll-Rand Co.
Nash Engineering Co.
Worthington Pump & Machinery Corp.

CONSULTING ENGINEERS
W. H. L. D. Betz
Frederic C. Clark
W. R. Cliffe
Ferguson, Hardy S.
Hardy, George P.
Johnson & Wierk, Inc.
The Kohler System Company
L. I. M. E.
Merritt-Chapman & Scott Corp.
Main, Inc., Chas. T.
O'Donoghue, Roderick
J. E. Sirrine & Co.
Stone & Webster Engrg. Corp.

CONVEYORS
Black-Clawson Company
Murray, D. J. Mfg. Co.
Ross Engineering Corp., J. O.

CORES
Elixman Paper Co.
Sonoco Products Co.
Rodney Hunt Machine Co.
Montague Machine Co.
Smith & Winchester Mfg. Co.
Walker-Goulard-Plehn Co.

COUPLINGS
Black-Clawson Company
De Laval Steam Turbine Co.
Farrel-Birmingham Co., Inc.
The Frederick Iron & Steel
E. D. Jones & Sons Co.
Moore & White Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works
Waldron Corp., John
Westinghouse Electric Mfg. Co.
T. B. Wood's Sons Company

CUTTERS
Thomas W. Hall Co.
Noble & Wood Mach. Co.
Perkins & Son, Inc., B. F.
The Smith & Winchester Mfg. Co.
Taylor Stiles & Co.

DAMPENERS
The Norwood Engineering Company
Perkins & Son, Inc., B. F.
Valley Iron Works Co.

DE-INKING
Kinsley Chemical Co.
O'Donoghue, Roderick

DIGESTERS
The Bigge Boiler Works Co.
H. K. Porter Company Inc.
Pusey & Jones Corp.

DOCTORS
Bird Machine Company
Black-Clawson Company
Downingtown Mfg. Co.
Lobdell Co.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

DOCTOR BLADES
Bisch-Clawson Company
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
Rotogravure Engrg. Co.
The Sandy Hill Iron & Brass Works
Simonds Worden White Co.
Shartle Brothers
United States Rubber Co.
Westinghouse Electric & Manufacturing Company

DRIERS
Black-Clawson Company
Murray Mfg. Co., D. J.
J. J. Ross Company
Ross, J. O. Engineering Corp.
Rotogravure Engrg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Traylor Engineering & Mfg. Co.
Valley Iron Works Co.
Waldron Corp., John

DRIVES
Allis-Chalmers Mfg. Co.
Appleton Machine Co.
Bird Machine Co.
Black-Clawson Company
Davis, Frank H., Co.
De Laval Steam Turbine Co.
Dilts Machine Works
Downingtown Mfg. Co.
Farrel-Birmingham Co.
General Electric Company
Horton Manufacturing Co.
Rodney Hunt Machine Co.
W. A. Jones Fdy. & Mch. Co.
Montague Machine Co.
Moore & White Co.
Murray, D. J. Mfg. Co.
Noble & Wood Machine Co.
Norwood Engrg. Co.
Pusey & Jones Corp.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
T. B. Wood's Sons Co.
Valley Iron Works Co.
Westinghouse Electric & Manufacturing Company

DUSTERS
Appleton Machine Co.
Downingtown Mfg. Co.
E. D. Jones & Son Co.
Moore & White Co.
Noble & Wood Machine Co.
Norwood Engrg. Co.
D. J. Murray Mfg. Co.

DYESTUFFS
Calco Chemical Co.
Ciba Company
E. I. du Pont de Nemours & Co.
Geigy Co., The
General Dyestuff Corp.
National Aniline Division, Allied Chemical & Dye Corp.
Paper Makers Chemical Department, Hercules Powder Co.
C. K. Williams & Co.
Witco Chemical Co.

EVAPORATORS
Black-Clawson Company
Goslin-Birmingham Mfg. Co., Inc.
Murray, D. J., Mfg. Co.
Traylor Engineering & Mfg. Co.

FANS
General Electric Co.
B. F. Perkins & Son, Inc.
Ross Engineering Co., J. O.

FEEDERS
Merrick Scale Mfg. Co.
Leeds & Northrup
Traylor Engineering Co.
Wallace & Tiernan

FELTS
Appleton Woolen Mills
Asten-Hill Mfg. Co.
Bloomfield Woolen Co.
Bulkley, Dunton Pulp Co., Inc.
Draper Bros. Corp.
Fitchburg Duck Mills
Huyck & Son, F. C.
Lockport Felt Co.
Mt. Vernon-Woodbury Mills, Inc.
Morey Paper Mill Supply Co.
Orr Felt & Blanket Co.
Shuler & Benninghofen
Waterbury Felt Co.
Woodward, Baldwin & Co.

FELT GUIDES
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Waldron Corp., John

FILLERS
American Colloid Co.
Amer. Cyanamid & Chem. Corp.
International Pulp Co.
W. H. Loomis Talc Corp.
Union Talc Co.
Vanderbilt Co., R. T.
Wishnick-Tumpeer, Inc.

FILTERS
Moore & White Co.
The Norwood Engineering Company
J. O. Ross Engrg. Corp.
Worthington Pump & Mchy. Corp.
Witco Chemical Co.

FLOORING, GRATING & TREADS
Hendrick Mfg. Co.
Klemp, W. F., Co.
Norton Co.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc.
Robinson, C. P.
United States Rubber Co.

FORMING MACHINES
Downingtown Mfg. Co.
Noble & Wood Machine Co.
Oliver United Filters
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

WHERE TO BUY

GEARS
Black-Clawson Company
De Laval Steam Turbine Co.
Downingtown Mfg. Co.
Farrel-Birmingham Co.
E. D. Jones & Sons Co.
Moore & White Co.
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.
Waldron Corp., John

GRINDERS
Cowl-Hanchett Co.
Farrel-Birmingham Co.
Lobdell Car Wheel Co.
Montague Machine Co.
Samuel C. Rogers and Company
The Sandy Hill Iron & Brass Works

GRINDING WHEELS
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Simonds Worden White Co.
United States Rubber Co.

HEATING, VENTILATING AND AIR CONDITIONING
The Appleton Machine Co.
Armstrong Machine Works
E. D. Jones & Sons Co.
General Electric Co.
Grinnell Company
Leeds & Northrup
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
Ross Engineering Corp., J. O.
Shartle Brothers Machine Co.
Valley Iron Works Co.
Worthington Pump & Mchy Corp.

HOISTS
Appleton Machinery Co.
Dilts Machine Works
Rodney Hunt Machine Co.
Ingersoll-Rand Co.
E. D. Jones & Sons Co.

HOSE (Air, Water, Suction, etc.)
The Cincinnati Rubber Mfg. Co.
The Manhattan Rubber Manufacturing Division of Raybestos-Manhattan Inc.
United States Rubber Co.

INSTRUMENTS, TESTING AND MEASURING
W. H. & L. D. Betz
M. P. Bowsher
The Foxboro Company
General Electric
W. & L. E. Gurley
Leeds & Northrup Company
National Technical Laboratories
B. F. Perkins & Son
Taylor Instrument Cos.
Wallace & Tiernan Co., Inc.
Westinghouse Electric & Manufacturing Company
Wilkens-Anderson Co.

JORDAN FILLINGS
Appleton Machine Co.
Behr Brothers Mfg. Co.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

KNIVES
Black-Clawson Company
Dilts Machine Works, Inc.
Hamblet Machine Co.
E. D. Jones & Sons Co.
Simonds Worden White Co.
Valley Iron Works Co.

LABORATORY EQUIPMENT
Appleton Machine Co.
W. H. & L. D. Betz
Dilts Machine Works
E. D. Jones & Sons Co.
Leeds & Northrup Company
National Technical Laboratories
Noble & Wood Machine Co.
Taber Instrument Co.
Taylor Instrument Companies
Valley Iron Works Co.

LAY BOYS
Hamblet Machine Co.
Moore & White Co.
Shartle Brothers

LUBRICANTS
Gulf Oil Corporation
Gulf Refining Co.
Sinclair Refining Co.
Socony-Vacuum Oil Co., Inc.
Sun Oil Company
Tide Water Associated Oil Co.

MICROMETERS & CALIPERS
Farrel-Birmingham Co.
Montague Machine Co.
Lobdell Car Wheel Co.
Walker-Goulard-Plehn Co.

MIXERS
Youngstown Welding & Engrg. Co.

MOISTENING EQUIPMENT
The Spray Engineering Co.

MOTORS AND GENERATORS
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
General Electric Co.
Ingersoll-Rand Co.
Reliance Electric & Engrg. Co.
Westinghouse Electric & Manufacturing Company

PACKING BOXES
Johnson Corporation
Shartle Brothers Machine Co.

PACKING
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
United States Rubber Co.

PAPER MACHINES
Black-Clawson Company
Downingtown Mfg. Co.
Thomas W. Hall Co.
Moore & White Co.
Pusey & Jones
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester

PAPER MACHINE SLICES
Black-Clawson Company
E. D. Jones & Sons Co.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Valley Iron Works Co.

PAPER TUBE MACHINERY
Dietz Machine Works
Thomas W. Hall Co.
Hudson Sharp Machine Company
Langston Co., Samuel M.

PASTING MACHINES
Black-Clawson Company
Davis, Frank H., Co.
Murray, D. J., Mfg. Co.
Moore & White Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.
Waldron Corp., John

PERFORATED METAL
Allis-Chalmers Mfg. Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.

PIPE
The American Rolling Mill Co.
Black-Clawson Company
Crane Company
Grinnell Company
Shartle Brothers Machine Co.
Taylor Forge & Pipe Works
Walworth Company
Youngstown Welding & Engrg. Co.

PLATERS
The Norwood Engineering Company
Perkins & Son, Inc., B. F.

PLATES
The American Rolling Mill Co.
Black-Clawson Company
Hendrick Mfg. Co.
Klemp, W. F., Co.
J. O. Ross Engrg. Corp.
Shartle Brothers Machine Co.
Timken Roller Bearing Co.

PLUGS
Black-Clawson Company
E. D. Jones & Sons Co.
The Noble & Wood Machine Co.
The Richardson Economy Plug Co.
Shartle Brothers Machine Co.

PRESSES
Black-Clawson Company
Farrel-Birmingham Co.
Dietz Machine Wks.
Thomas W. Hall Co.
Hudson-Sharp Machine Co.
Paper Converting Machine Co., Inc.
Potdevin Machine Co.
Rotogravure Engineering Co.
Shartle Brothers
Valley Iron Works Co.
Waldron Corp., John
Weber, Homer G.

RUG MILLS
Traylor Engineering & Mfg. Co.

PULPS
Andersen Co., J.
Bulkley, Dunton Pulp Co., Inc.
Gottesman & Co., Inc.
Perkins-Goodwin Co.
Price & Pierce, Ltd.
Pulp and Paper Trading Co.

PUMPS
Allis-Chalmers Mfg. Co.
Black-Clawson Company
Dorr Company
Downingtown Mfg. Co.
De Laval Steam Turbine Co.
Frederick Iron and Steel Co.
Ingersoll-Rand Co.
Johnson Corp.
Lombard Governor Corp.
Moore & White Co.
Nash Engineering Co.
Noble & Wood Machine Co.
Paper Converting Mch. Co.
Quimbey Pump Co. Div. of H. K. Porter Company, Inc.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Warren Steam Pump Company
Worthington Pump & Machinery Corp.

RECOVERY SYSTEMS
Bulkley, Dunton Pulp Co., Inc.
Rodney Hunt Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Pusey & Jones
Ross Engineering Corp. J. O.
Valley Iron Works Co.

RECTANGULAR BINS
Traylor Engineering & Mfg. Co.

REELS
Black-Clawson Company
Downingtown Mfg. Co.
De Laval Steam Turbine Co.
Hudson Sharp Machine Company
The Kohler System Company
Montague Machine Co.
Moore & White Co.
The Norwood Engineering Company
Paper Converting Mch. Co.
Rodney Hunt Machine Co.
Rotogravure Engrg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
The Smith & Winchester Mfg. Co.

REFINERS
Appleton Machine Co.
Behr Brothers Mfg. Co.
Bauer Brothers Co.
Dilts Machine Works
The Hermann Manufacturing Co.
E. D. Jones & Sons Co.
Murray, D. J. Mfg. Co.
Noble & Wood Machine Co.
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Sprout, Waldron & Co.
Valley Iron Works

REGULATORS
Allis-Chalmers Mfg. Co.
Armstrong Machine Works
Bird Machine Company
The Brown Instrument Co.
The Foxboro Company
Jones, E. D., & Sons Co.
General Electric Co.
Johnson Corp.
Leeds & Northrup Company
National Technical Laboratories
Noble & Wood Machine Co.
Shartle Brothers
Taylor Instrument Companies
Wallace & Tiernan
Westinghouse Electric & Manufacturing Company

RESINS
American Cyanamid & Chemical Corp.
The Neville Company
The Resinous Products & Chemical Co.

ROLLS
Appleton Machine Co.
Black-Clawson Company
Downingtown Mfg. Co.
Farrel-Birmingham Co.
Improved Paper Machy. Corp.
Lobdell Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
D. J. Murray Mfg., Co.
Noble & Wood Machine Co.
The Norwood Engineering Company
Perkins, B. F., & Sons Co.
Pusey & Jones Corp.
Roehlen Engraving Co.
J. J. Ross Company
Rodney Hunt Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Shenango-Penn Mold Co.
Sinclair Co.
Smith & Winchester Mfg. Co.
Stearns Magnetic Mfg. Co.
United States Rubber Co.
Valley Iron Works Co.
Waldron Corp., John

ROLL COVERS
The Cincinnati Rubber Mfg. Co.
Youngstown Welding & Engrg. Co.

ROLL STANDS
Cameron Machine Co.
Johnstone Eng. & Machine Co.
The Kohler System Company
Moore & White Co.
Potdevin Machine Co.
Rotogravure Engrg. Co.
Shartle Brothers Machine Co.

ROTARY KILNS
Traylor Engineering & Mfg. Co.

SATURATING MACHINES
Black-Clawson Company
Moore & White Co.
Noble & Wood Machine Co.
Potdevin Machine Co.
Rotogravure Engrg. Co.
Shartle Brothers Machine Co.
Waldron Corp., John
Weber, Herman C.

SCALES
Merrick Scale Mfg. Co.

SCREEN PLATES
Pitchburg Screen Plate Co.
Morey Paper Mill Supply Co.
Union Machine Co.
Union Screen Plate Co.

SCREENS
Allis-Chalmers Mfg. Co.
Appleton Wire Works
Appleton Machine Co.
Bird Machine Company
Carthage Machine Co.
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
Harrington & King Perforating Co.
Hendrick Manufacturing Co.
E. D. Jones & Sons Co.
Montague Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Traylor Engineering & Mfg. Co.
Valley Iron Works Co.

SCRUBBERS
Traylor Engineering & Mfg. Co.

SHEET MACHINES
Thomas W. Hall Co.
The Hermann Manufacturing Co.
Noble & Wood Machine Co.
Rotogravure Engrg. Co.
Valley Iron Works Co.

SHOWER PIPES
Bird Machine Company
A. E. Broughton & Co.
Downingtown Mfg. Co.
Improved Paper Machy. Corp.
Moore & White Co.
Shartle Bros. Mach. Co.
Smith & Winchester Mfg. Co.

SHREDDERS
Bauer Brothers Co.
Carthage Machine Co.

SIZING
American Cyanamid & Chemical Co.
Black-Clawson Company
The Dow Chemical Co.
du Pont, E. I., de Nemours & Co.
National Oil Products Co.
Paper Makers Chemical Department, Hercules Powder Co.
Socony-Vacuum Co.
Philadelphia Quartz Co.

SIZING PROCESSES
National Oil Products Co.

SLITTERS
Black-Clawson Company
Cameron Machine Co.
Carthage Machine Co.
Dietz Machine Works
Downingtown Mfg. Co.
Thomas W. Hall Co., Inc.
Hamblet Machine Co.
Hudson Sharp Machine Company
Johnstone Eng. & Machine Co.
Langston Co., Samuel M.
Moore & White Co.
D. J. Murray Mfg. Co.
Potdevin Machine Co.
Rotogravure Engrg. Co.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Simonds Worden White Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.
Waldron Corp., John

SPRAY NOZZLES
The Spray Engineering Co.

STARCH
American Cyanamid & Chemical Corp.
Clinton Co.
National Starch Products, Inc.
Stein, Hall & Co., Inc.

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Shartle Bros. Mch. Co.
Sickle Steam Specialties Co.

STRAPPING & STRAPPING MACHINES
Acme Steel Co.
The Stanley Works

STUFF CHESTS
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

SUCTION BOXES
Black-Clawson Company
A. E. Broughton & Co.
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Westinghouse Electric & Manufacturing Company.

SULPHUR
American Cyanamid & Chemical Corp.
Stauffer Chemical Company
Texas Gulf Sulphur Co.
Witco Chemical Company

SULPHUR BURNERS
Valley Iron Works Co.

TALC
American Cyanamid & Chemical Corp.
W. H. Loomis Talc Corp.
International Talc Company

TANKS
Frederick Mfg. Co.
E. D. Jones & Sons Co.
Kalamazoo Tank & Silo Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
The Noble & Wood Machine Co.
H. K. Porter Company Inc.
Rodney Hunt

J. O. Ross Engrg. Corp.
Shartle Brothers Machine Co.
Traylor Engineering & Mfg. Co.
United States Rubber Co.
Waldron Corp., John
Youngstown Welding & Engrg. Co.

THICKENERS, DECKERS & SAVEALLS
Bird Machine Company
Bulkley, Dunton Pulp Co. Inc.
Carthage Machine Co.
Dilts Machine Works
Dorr Co.
Downingtown Mfg. Co.
Montague Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

TITANIUM
E. I. Du Pont de Nemours & Co.
Titanium Pigment Co.
R. T. Vanderbilt Co.
Witco Chemical Company

TOOLS
Acme Steel Company
Ingersoll-Rand Co.
The Stanley Works
Walworth Company

TRUCKS
Elwell Parker Electric Co.
Wright-Hibbard Ind. Elec. Truck Co.

TRAPS
Armstrong Machine Works
Crane Co.
Grinnel Company
Johnson Corporation
Shartle Bros. Mch. Co.

TUBS
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Rodney Hunt Machine Co.
Shartle Brothers
Valley Iron Works Co.

TURBINES
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
General Electric Company
Hunt, Rodney, Mach. Co.
Westinghouse Electric & Manufacturing Company
Worthington Pump & Machinery Corp.

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Gibbs-Brower Co.
Thomas W. Hall Co.
Noble & Wood Machine Co.
Rotogravure Engrg. Co.
J. J. Ross Company
Shartle Brothers Machine Co.

VALVES
Crane Company
Dilts Machine Works
The Foxboro Company
E. D. Jones & Sons Co.
Kennedy Valve Mfg. Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
William Powell Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Taylor Instrument Companies
Valley Iron Works Co.
Walworth Company

VATS & VAT PARTS
Union Machine Co.
Union Screen Plate Co.

WASHERS
Bird Machine Company
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Moore & White Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Rodney Hunt Machine Co.
Shartle Brothers Machine Co.
Valley Iron Works Co.

WAXING MACHINERY
Black-Clawson Co.
Potdevin Machine Co.
Rotogravure Engrg. Co.
Shartle Brothers Machine Co.
Waldron Corp., John
Weber, Herman G.

WELDING EQUIPMENT
Allis-Chalmers Mfg. Co.
General Electric Company
Walworth Company
Westinghouse Electric & Manufacturing Company

WET MACHINES
Black-Clawson Co.
Carthage Machine Co.
Downingtown Mfg. Co.
Moore & White Co.
Montague Machine Co.
Noble & Wood Machine Co.
Pusey & Jones Corp.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

WINDERS AND REWINDERS
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Cameron Machine Co.
Dietz Machine Works
Downingtown Mfg. Co.
Thomas W. Hall Co.
Hudson-Sharp Mach. Co.
Langston Co., Samuel M.
Johnstone Eng. & Machine Co.
The Kohler System Company
Montague Machine Co.
Moore & White Co.
Paper Converting Mch. Co.
Potdevin Machine Co.
Pusey & Jones Corp.
Rotogravure Engrg. Co.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Smith & Winchester Mfg. Co.
Waldron Corp., John

WIRES
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FROM FOREST TO FOURDRINIER

The road from wood to paper is a long one. Its stages embrace a complex process of outdoor operations, transportation, engineering, chemistry, research, manufacturing, and a great many other elements that combine into one of the great industries of our modern civilization. Close to the problems of pulp and paper manufacturing and marketing, Bulkley, Dunton with its intimate knowlegdge of distribution and merchandising has rendered valuable service to the industry for over a century.

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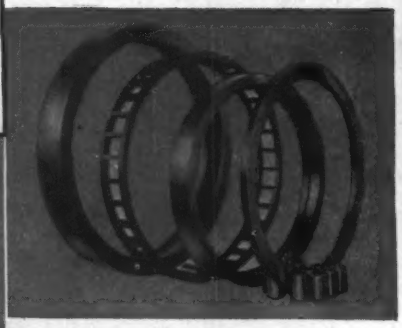
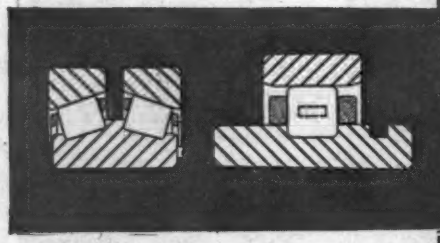
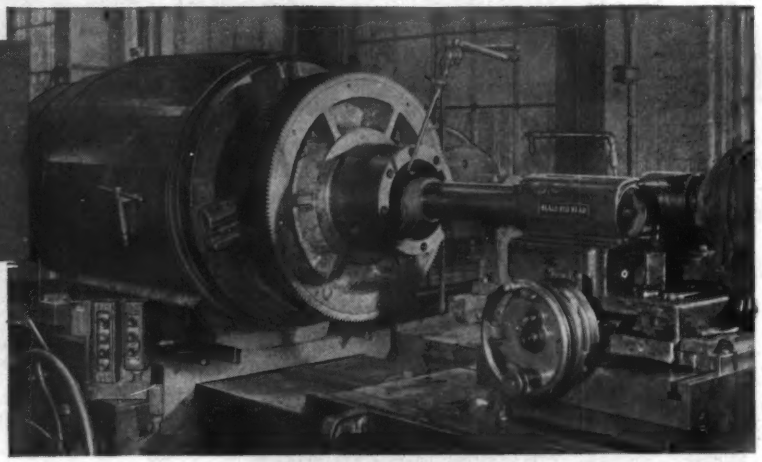
IN THE NEWS
WITH TORRINGTON BEARINGS

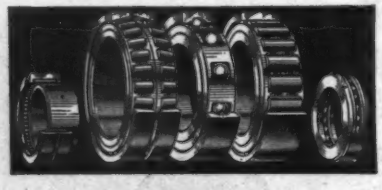


MEETING DESIGN REQUIREMENTS of the Emsco Derrick & Equipment Company, the engineers of Torrington's Bantam Bearings Division custom-built the 27½" O.D. Radial Roller Bearings employed in the sheaves of the crown and traveling blocks. The bearings, mounted on a center drum, are located close to the rope grooves to conserve wire line, prevent hazardous tilting, and to minimize wear on the sheaves.

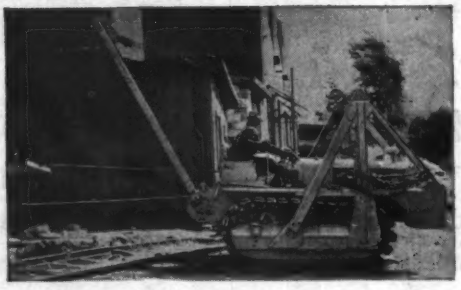




GRINDING HEAVY PARTS TO PRECISION LIMITS, this mammoth grinder, built by the Ingersoll Milling Machine Company, utilizes a Torrington Tapered Roller Bearing to carry the heavy radial and thrust loads encountered in the operation of the spindle. It is mounted directly behind the chucking mechanism which holds the work in position for grinding. A tapered bore radial roller bearing is mounted on the back end of the spindle, where a "V" belt pulley connects direct to the motor drive. After four years in operation the eccentricity and face run-out of these bearings is .00025.



DESIGNERS of this Williamette Hyster towing winch, installed on a Caterpillar tractor, specified heavy-duty Torrington Needle Bearings for use in the idler and reverse gears. The Williamette Hyster Company says, "Because of the restricted space in the comparatively small gears, needle bearings are the only practical type of anti-friction bearings that can be used."



EVERY MAJOR TYPE OF ANTI-FRICTION BEARINGS is included in the Torrington line—straight roller, tapered roller, needle and ball. In addition to supplying every branch of industry with a wide range of standard bearings, the engineering staff of Torrington's Bantam Bearings Division designs bearings in large sizes and of special types for new or unusual applications. For experienced counsel in meeting today's requirements—or assistance in postwar plans TURN TO TORRINGTON.

ARMY E NAVY

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